



HALEY WARD

ENGINEERING | ENVIRONMENTAL | SURVEYING

# Stormwater Report

## Dresser Woods New Housing

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## **Introduction**

The Salisbury Housing Committee intends to construct a 20 unit affordable housing project on 5.32 acres at the north end of Railroad Street. Stormwater runoff ultimately reaches Spruce Swamp Creek which lies approximately 400 feet to the east of the site.

## **Site Description**

The property lies in the R-10 Residence Zone with the Multi-Family Housing (MFH) Overlay Zone and is predominately mature forest. There are wetlands and two vernal pools on the north side of the site. The property slopes to the east at varying grades of 3% to 20%. The development occurs in areas of moderate grades generally less than 12%. The underlying non-wetland soils are predominately gravelly sandy loam. The site lies within an aquifer protection area.

Stormwater runoff leaves the site in an easterly direction through three broad swales that lead to Spruce Swamp Creek. For purposes of this report and the accompanying calculations, the discharges are broken down as follows:

The Southerly Watershed: This watershed collects runoff from the southern portion of the site and releases it to a broad swale that leads into the East Meadow neighborhood and then to Spruce Swamp Creek.

The Easterly Watershed: This watershed collects runoff from a small portion of the east side of site and releases it to a wooded area that flows through open space and then to Spruce Swamp Creek.

The Vernal Pool Watershed: This watershed collects runoff from the northern portion of the site and releases it to the on-site wetlands and then to through an open space area and eventually to Spruce Swamp Creek.

## **Proposed Project**

The project involves the construction of nine buildings housing 20 units of housing. Eight of the buildings have two units each and one has four units. The project will include 21 paved parking spaces and 10 overflow parking spaces on a grass paver system. There will be a network of bituminous sidewalks for pedestrian travel.

## **Stormwater Management Practices**

The project uses the following stormwater management practices:

- Reduced impervious coverage to minimize changes in hydrology, some of the parking spaces use a grass paver system to reduce the extent of pavement

- Rain gardens to treat the first inch of runoff from seven out of the nine buildings. The remaining two buildings direct their downspouts to splashpads and flow overland. All of the buildings that direct runoff toward the vernal pools have rain gardens.
- The parking area and a substantial portion of the other developed areas of the site are directed to a FocalPoint treatment system. The FocalPoint is a modular treatment system that includes plantings and a high-performance filter media.
- A subsurface detention system reduces peak flows to acceptable levels. Level spreaders are used at each discharge point.
- Minimal disturbance of the 100-foot vernal pool envelope.

There are two underground detention basins. One collects runoff from the majority of the developed portion of the site and releases it to the southerly watershed. A second detention basin collects runoff from the far western developed portion of the site and releases it to the northern end of the vernal pool watershed. The basins have been sized to maintain predevelopment peak flow rates for the 2, 10, 25, 50, and 100-year storm events. Pretreatment for the larger detention basin is provided by the FocalPoint System. Pretreatment for the smaller detention basin is provided by a rain garden.

The outflow from the detention basins are directed to level spreaders before draining into the woods. Detention basin outflow will accumulate in the galleries and discharge through the manufactured openings in the downstream face of the galleries. This facility will spread detention-basin outflow over a wide area at the point of discharge to minimize flow velocity and depth.

## Summary of Results

The pre-development and post-development peak discharge rates are presented in the following tables:

**Combined Hydrographs**

| Reccurance Interval | Pre-Development Flow | Post Development Flow | $\Delta$ Post - Pre |
|---------------------|----------------------|-----------------------|---------------------|
| 2 Year              | 2.3                  | 2.2                   | -0.1                |
| 10 Year             | 3.9                  | 3.7                   | -0.2                |
| 25 Year             | 4.8                  | 4.6                   | -0.2                |
| 50 Year             | 5.4                  | 5.2                   | -0.2                |
| 100 Year            | 6.1                  | 5.9                   | -0.2                |

**Vernal Pool Watershed**

| Reccurance Interval | Pre-Development Flow | Post Development Flow | $\Delta$ Post - Pre |
|---------------------|----------------------|-----------------------|---------------------|
| 2 Year              | 1.9                  | 1.9                   | 0.0                 |
| 10 Year             | 3.1                  | 3.1                   | 0.0                 |
| 25 Year             | 3.8                  | 3.9                   | 0.1                 |
| 50 Year             | 4.3                  | 4.4                   | 0.1                 |
| 100 Year            | 6.1                  | 4.9                   | -1.2                |

**Southerly Watershed**

| Reccurance Interval | Pre-Development Flow | Post Development Flow | $\Delta$ Post - Pre |
|---------------------|----------------------|-----------------------|---------------------|
| 2 Year              | 0.5                  | 0.2                   | -0.3                |
| 10 Year             | 0.9                  | 0.3                   | -0.6                |
| 25 Year             | 1.0                  | 0.4                   | -0.6                |
| 50 Year             | 1.2                  | 0.5                   | -0.7                |
| 100 Year            | 1.3                  | 0.5                   | -0.8                |

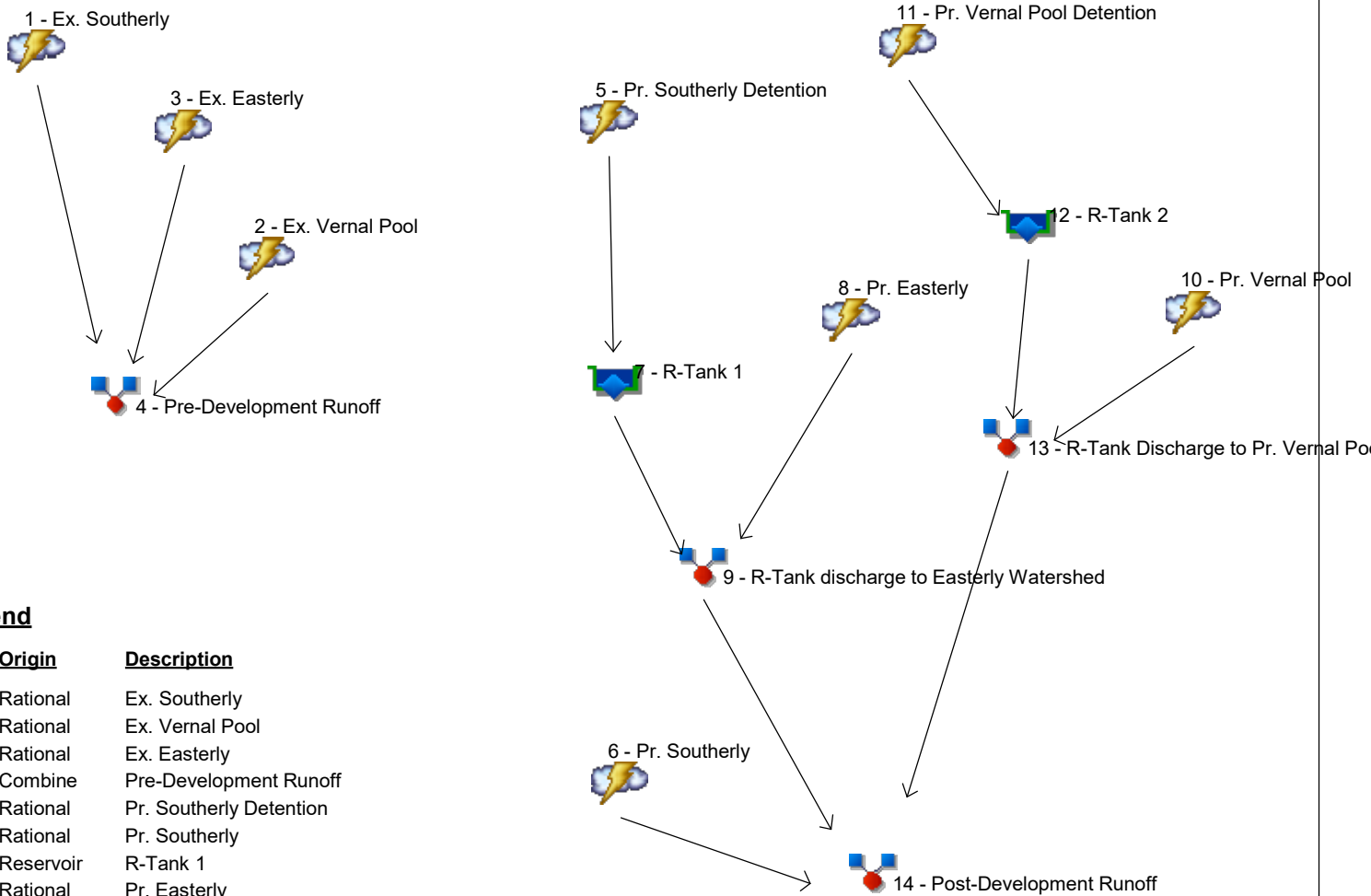
**Easterly Watershed**

| Reccurance Interval | Pre-Development Flow | Post Development Flow | $\Delta$ Post - Pre |
|---------------------|----------------------|-----------------------|---------------------|
| 2 Year              | 0.03                 | 0.5                   | 0.5                 |
| 10 Year             | 0.05                 | 0.8                   | 0.8                 |
| 25 Year             | 0.06                 | 1.0                   | 0.9                 |
| 50 Year             | 0.06                 | 1.1                   | 1.1                 |
| 100 Year            | 0.07                 | 1.3                   | 1.2                 |

## A. Watershed Model Schematic

# Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024



## Legend

| Hyd. Origin  | Description                            |
|--------------|--|
| 1 Rational   | Ex. Southerly                          |
| 2 Rational   | Ex. Vernal Pool                        |
| 3 Rational   | Ex. Easterly                           |
| 4 Combine    | Pre-Development Runoff                 |
| 5 Rational   | Pr. Southerly Detention                |
| 6 Rational   | Pr. Southerly                          |
| 7 Reservoir  | R-Tank 1                               |
| 8 Rational   | Pr. Easterly                           |
| 9 Combine    | R-Tank discharge to Easterly Watershed |
| 10 Rational  | Pr. Vernal Pool                        |
| 11 Rational  | Pr. Vernal Pool Detention              |
| 12 Reservoir | R-Tank 2                               |
| 13 Combine   | R-Tank Discharge to Pr. Vernal Pool    |
| 14 Combine   | Post-Development Runoff                |

## B. Hydrologic Input

Tc Calculations

CN Calculations

Watershed Maps





**Watershed I.D.: Existing Southerly Watershed**

Estimate Time of Concentration using the "Velocity Method".

Reference: USDA-NRCS National Engineering Handbook - Part 630 -Hydrology; Chapter 15 - Time of Concentration and USDA-NRCS TR-55 - June 1986

**SHEET FLOW**

| Step No. | Data   | Seg. I.D.: | 1                       | Seg. I.D.: | 2                |
|----------|--|------------|-------------------------|------------|------------------|
| 1A       | Select Surface Description Identifier (Table 3-1)      |            | I                       |            |                  |
| 1B       | Surface Description (Table 3-1)                        |            | Woods: Light Underbrush |            |                  |
| 2        | Manning's Roughness Coefficient "n" (Table 3-1)        |            | 0.400                   |            |                  |
| 3        | Flow Length "L" (FT) - Note: Total L must be <= 100 FT |            | 27.5                    |            |                  |
| 4        | Two-Year 24-Hour Rainfall "P <sub>2</sub> " (Inches)   |            | 3.1                     |            |                  |
| 5        | Land Slope "S" (FT / FT)                               |            | 0.030                   |            |                  |
| 6        | Travel Time "T <sub>T</sub> " (Hours)                  |            | 0.110                   |            |                  |
|          |  |            |                         |            | T <sub>T</sub> = |
|          |  |            |                         |            | <b>0.110</b>     |

$$T_T = \frac{0.007 \times (n \times L)^{0.8}}{P_2^{0.5} \times S^{0.4}}$$

NRCS TR-55 Table 3-1

| Identifier | Surface Description                              | Manning's "n" |
|------------|--|---------------|
| A          | Smooth Surfaces (Conc., Asph., Grav., Bare Soil) | 0.011         |
| B          | Fallow (No Residue)                              | 0.050         |
| C          | Cultivated Soils (Residue Cover <= 20%)          | 0.060         |
| D          | Cultivated Soils (Residue Cover > 20%)           | 0.170         |
| E          | Grass: Short Grass Prairie                       | 0.150         |
| F          | Grass: Dense Grasses                             | 0.240         |
| G          | Grass: Bermuda Grass                             | 0.410         |
| H          | Range (Natural)                                  | 0.130         |
| I          | Woods: Light Underbrush                          | 0.400         |
| J          | Woods: Dense Underbrush                          | 0.800         |

**SHALLOW CONCENTRATED FLOW**

| Step No. | Data                                     | Segment I.D. |        |   |   |   |   |
|----------|--|--------------|--------|---|---|---|---|
|          |  | 3            | 4      | 5 | 6 | 7 | 8 |
| 7        | Surface Description (Paved or Unpaved)   | U            | U      |   |   |   |   |
| 8        | Flow Length "L" (FT)                     | 103          | 54     |   |   |   |   |
| 9        | Watercourse Slope "S" (FT/FT)            | 0.0270       | 0.0900 |   |   |   |   |
| 10       | Average Velocity "V" (FT/SEC) Figure 3-1 | 2.65         | 4.84   |   |   |   |   |
| 11       | Travel Time "T <sub>T</sub> " (Hours)    | 0.011        | 0.003  |   |   |   |   |

$$T_T = \frac{L}{3600 \times V}$$

Unpaved Condition:  
 $V = 16.1345 \times S^{0.5}$

Paved Condition:  
 $V = 20.3282 \times S^{0.5}$

T<sub>T</sub> = **0.014**



**OPEN CHANNEL FLOW**

Note: Hydraulic properties estimated from the worksheets that follow below.

| Step No. | Data                                  | Segment I.D.                    |        |        |    |    |    |    |                      |
|----------|---------------------------------------|---------------------------------|--------|--------|----|----|----|----|----------------------|
|          |                                       | 9                               | 10     | 11     | 12 | 13 | 14 | 15 |                      |
| 12A      | Channel or Pipe Flow? (C or P)        | C                               | C      | C      |    |    |    |    |                      |
| 12B      | Cross Sectional Flow Area (SF)        | 0.19                            | 0.22   | 0.30   |    |    |    |    |                      |
| 13       | Wetted Perimeter (FT)                 | 3.41                            | 3.61   | 4.01   |    |    |    |    |                      |
| 14       | Hydraulic Radius (FT)                 | 0.06                            | 0.06   | 0.07   |    |    |    |    |                      |
| 14       | Channel or Pipe Slope (FT/FT)         | 0.0140                          | 0.0190 | 0.0220 |    |    |    |    |                      |
| 16       | Manning's Roughness Coefficient       | 0.024                           | 0.024  | 0.024  |    |    |    |    |                      |
| 17       | Velocity (FT/SEC)                     | 1.07                            | 1.34   | 1.63   |    |    |    |    |                      |
| 18       | Flow Length (L) (FT)                  | 148                             | 108    | 104    |    |    |    |    |                      |
| 19       | Travel Time "T <sub>T</sub> " (Hours) | 0.039                           | 0.022  | 0.018  |    |    |    |    |                      |
|          |                                       | $T_T = \frac{L}{3600 \times V}$ |        |        |    |    |    |    | $T_T =$ <b>0.079</b> |

Step 20: Watershed Time of Concentration (Add T<sub>T</sub> from Steps 6, 11, and 19):

|                |                           |                 |   |   |  |
|----------------|---------------------------|-----------------|---|---|--|
| <u>Step 6:</u> | <u>Step 11:</u>           | <u>Step 19:</u> |   |   |  |
| T <sub>T</sub> | T <sub>T</sub>            | T <sub>T</sub>  |   |   |  |
| Sheet Flow     | Shallow Concentrated Flow | Channel Flow    |   |   |  |
| <b>0.110</b>   | <b>0.014</b>              | <b>0.079</b>    | + | + | =  |
|                |                           |                 |   |   | <b>0.203</b> Hours                         |
|                |                           |                 |   |   | Tc Converted to Minutes: <b>12</b> Minutes |

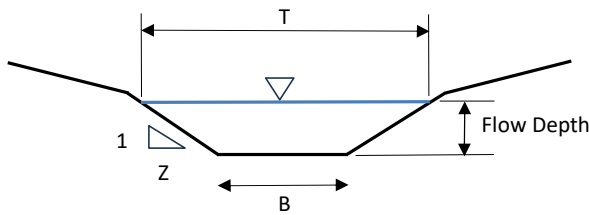
Notes:

1. The sum of all sheet-flow travel lengths is <= 100 FT as recommended in NRCS NEH Part 630 Chapter 15.
3. The sum of sheet-flow travel length is <= 10% of total hydraulic length (OK)
3. The sheet flow travel time is less than 80% of Tc (OK)
4. The sum of shallow-concentrated flow segment lengths is < 1,000 FT (OK)

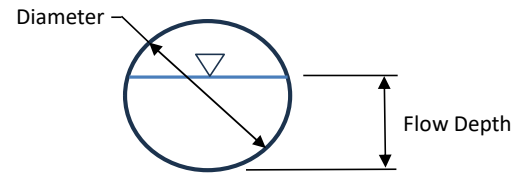


The following worksheets estimate velocity and flow rate for a channel with simple geometry or a round storm sewer. The calculations are used to estimate travel time for open-channel flow conditions. Individual segments may be either channel flow or pipe flow, but not both.

- Notes:**
1. Flow rate in the various segments should gradually build (in general proportion to drainage area) toward the computed two-year recurrence-interval flood at the point of analysis.
  2. In the case of flow in natural or man-made channels, flow depth should not exceed bank-full height.



Open Channel



Storm Sewer

**Open Channel Segments**

|                    |                                 | Segment I.D. |        |        |    |    |    |    |
|--------------------|---------------------------------|--------------|--------|--------|----|----|----|----|
| Item               |                                 | 9            | 10     | 11     | 12 | 13 | 14 | 15 |
| Channel Geometry   | Flow Depth (FT)                 | 0.07         | 0.08   | 0.10   |    |    |    |    |
|                    | Channel Slope (FT/FT)           | 0.0140       | 0.0190 | 0.0220 |    |    |    |    |
|                    | Manning's Roughness Coefficient | 0.024        | 0.024  | 0.024  |    |    |    |    |
|                    | Bank Slope (Z:1)                | 10.00        | 10.00  | 10.00  |    |    |    |    |
|                    | B - Channel Base Width (FT)     | 2.00         | 2.00   | 2.00   |    |    |    |    |
| Channel Hydraulics | T - Flow Top Width (FT)         | 3.4          | 3.6    | 4      |    |    |    |    |
|                    | Flow Area (SF)                  | 0.19         | 0.22   | 0.30   |    |    |    |    |
|                    | Wetted Perimeter (FT)           | 3.41         | 3.61   | 4.01   |    |    |    |    |
|                    | Hydraulic Radius (FT)           | 0.06         | 0.06   | 0.07   |    |    |    |    |
|                    | Flow (CFS)                      | 0.20         | 0.30   | 0.49   |    |    |    |    |
|                    | Average Velocity (FT/SEC)       | 1.07         | 1.34   | 1.63   |    |    |    |    |

**Pipe Segments**

|                       |   | Segment I.D. |    |    |    |    |      |         |
|-----------------------|---|--------------|----|----|----|----|------|---------|
| Item                  |   | 9            | 10 | 11 | 12 | 13 | 14   | 15      |
| Pipe Characteristics  | Pipe Diameter (FT)                              |              |    |    |    |    |      |         |
|                       | Pipe Manning's Coefficient                      |              |    |    |    |    |      |         |
|                       | Pipe Slope (FT/FT)                              |              |    |    |    |    |      |         |
|                       | Full Pipe Area (SF)                             |              |    |    |    |    |      | 0.0000  |
|                       | Hydraulic Radius - Full Pipe (FT)               |              |    |    |    |    |      | 0.000   |
|                       | Q <sub>FULL</sub> - Full Pipe Flow (CFS)        |              |    |    |    |    |      | #DIV/0! |
|                       | V <sub>FULL</sub> - Full Pipe Velocity (FT/SEC) |              |    |    |    |    |      | #DIV/0! |
| Pipe Hydraulics       | R <sub>D</sub> - Flow Depth Ratio               |              |    |    |    |    |      |         |
|                       | Flow Depth (FT)                                 |              |    |    |    |    |      | 0.00    |
|                       | Cross Sectional Area of Flow (SF)               |              |    |    |    |    |      | 0.000   |
|                       | Wetted Perimeter (FT)                           |              |    |    |    |    |      | 0.000   |
|                       | Hydraulic Radius (FT)                           |              |    |    |    |    |      | 0.000   |
|                       | Q - Estimated Flow in Pipe (CFS)                |              |    |    |    |    |      | 0.00    |
|                       | V - Estimated Velocity in Pipe (FT/SEC)         |              |    |    |    |    |      | 0.00    |
|                       | Q / Q <sub>FULL</sub>                           |              |    |    |    |    |      | 0.00    |
| V / V <sub>FULL</sub> |   |              |    |    |    |    | 0.00 |         |



**Watershed I.D.: Vernal Pool Watershed**

Estimate Time of Concentration using the "Velocity Method".

Reference: USDA-NRCS National Engineering Handbook - Part 630 -Hydrology; Chapter 15 - Time of Concentration and USDA-NRCS TR-55 - June 1986

**SHEET FLOW**

| Step No. | Data   | Seg. I.D.: | <b>1</b>                | Seg. I.D.: | <b>2</b> |                  |
|----------|--|------------|-------------------------|------------|----------|------------------|
| 1A       | Select Surface Description Identifier (Table 3-1)      |            | <b>I</b>                |            |          |                  |
| 1B       | Surface Description (Table 3-1)                        |            | Woods: Light Underbrush |            |          |                  |
| 2        | Manning's Roughness Coefficient "n" (Table 3-1)        |            | <b>0.400</b>            |            |          |                  |
| 3        | Flow Length "L" (FT) - Note: Total L must be <= 100 FT |            | <b>22</b>               |            |          |                  |
| 4        | Two-Year 24-Hour Rainfall "P <sub>2</sub> " (Inches)   |            | <b>3.1</b>              |            |          |                  |
| 5        | Land Slope "S" (FT / FT)                               |            | <b>0.013</b>            |            |          | T <sub>T</sub> = |
| 6        | Travel Time "T <sub>T</sub> " (Hours)                  |            | <b>0.129</b>            |            |          | <b>0.129</b>     |

$$T_T = \frac{0.007 \times (n \times L)^{0.8}}{P_2^{0.5} \times S^{0.4}}$$

NRCS TR-55 Table 3-1

| Identifier | Surface Description                              | Manning's "n" |
|------------|--|---------------|
| A          | Smooth Surfaces (Conc., Asph., Grav., Bare Soil) | 0.011         |
| B          | Fallow (No Residue)                              | 0.050         |
| C          | Cultivated Soils (Residue Cover <= 20%)          | 0.060         |
| D          | Cultivated Soils (Residue Cover > 20%)           | 0.170         |
| E          | Grass: Short Grass Prairie                       | 0.150         |
| F          | Grass: Dense Grasses                             | 0.240         |
| G          | Grass: Bermuda Grass                             | 0.410         |
| H          | Range (Natural)                                  | 0.130         |
| I          | Woods: Light Underbrush                          | 0.400         |
| J          | Woods: Dense Underbrush                          | 0.800         |

**SHALLOW CONCENTRATED FLOW**

| Step No. | Data                                     | Segment I.D.  |               |               |               |          |          |
|----------|--|---------------|---------------|---------------|---------------|----------|----------|
|          |  | <b>3</b>      | <b>4</b>      | <b>5</b>      | <b>6</b>      | <b>7</b> | <b>8</b> |
| 7        | Surface Description (Paved or Unpaved)   | <b>U</b>      | <b>U</b>      | <b>U</b>      | <b>U</b>      |          |          |
| 8        | Flow Length "L" (FT)                     | <b>259</b>    | <b>19.4</b>   | <b>76.74</b>  | <b>64.15</b>  |          |          |
| 9        | Watercourse Slope "S" (FT/FT)            | <b>0.0130</b> | <b>0.2660</b> | <b>0.0420</b> | <b>0.2470</b> |          |          |
| 10       | Average Velocity "V" (FT/SEC) Figure 3-1 | <b>1.84</b>   | <b>8.32</b>   | <b>3.31</b>   | <b>8.02</b>   |          |          |
| 11       | Travel Time "T <sub>T</sub> " (Hours)    | <b>0.039</b>  | <b>0.001</b>  | <b>0.006</b>  | <b>0.002</b>  |          |          |

$$T_T = \frac{L}{3600 \times V}$$

Unpaved Condition:  
 $V = 16.1345 \times S^{0.5}$

Paved Condition:  
 $V = 20.3282 \times S^{0.5}$

T<sub>T</sub> = **0.048**



**OPEN CHANNEL FLOW**

Note: Hydraulic properties estimated from the worksheets that follow below.

| Step No.                        | Data                                  | Segment I.D.                  |    |    |    |    |    |    |
|---------------------------------|---------------------------------------|-------------------------------|----|----|----|----|----|----|
|                                 |                                       | 9                             | 10 | 11 | 12 | 13 | 14 | 15 |
| 12A                             | Channel or Pipe Flow? (C or P)        |                               |    |    |    |    |    |    |
| 12B                             | Cross Sectional Flow Area (SF)        |                               |    |    |    |    |    |    |
| 13                              | Wetted Perimeter (FT)                 |                               |    |    |    |    |    |    |
| 14                              | Hydraulic Radius (FT)                 |                               |    |    |    |    |    |    |
| 14                              | Channel or Pipe Slope (FT/FT)         |                               |    |    |    |    |    |    |
| 16                              | Manning's Roughness Coefficient       |                               |    |    |    |    |    |    |
| 17                              | Velocity (FT/SEC)                     |                               |    |    |    |    |    |    |
| 18                              | Flow Length (L) (FT)                  |                               |    |    |    |    |    |    |
| 19                              | Travel Time "T <sub>T</sub> " (Hours) |                               |    |    |    |    |    |    |
| $T_T = \frac{L}{3600 \times V}$ |                                       | T <sub>T</sub> = <b>0.000</b> |    |    |    |    |    |    |

Step 20: Watershed Time of Concentration (Add T<sub>T</sub> from Steps 6, 11, and 19):

|                |                           |                 |   |   |   |  |
|----------------|---------------------------|-----------------|---|---|---|--|
| <u>Step 6:</u> | <u>Step 11:</u>           | <u>Step 19:</u> |   |   |   |  |
| T <sub>T</sub> | T <sub>T</sub>            | T <sub>T</sub>  |   |   |   |  |
| Sheet Flow     | Shallow Concentrated Flow | Channel Flow    |   |   |   |  |
| <b>0.129</b>   | <b>0.048</b>              | <b>0.000</b>    | + | + | = | <b>0.177</b> Hours                         |
|                |                           |                 |   |   |   | Tc Converted to Minutes: <b>11</b> Minutes |

Notes:

1. The sum of all sheet-flow travel lengths is <= 100 FT as recommended in NRCS NEH Part 630 Chapter 15.
2. The sum of sheet-flow travel length is <= 10% of total hydraulic length (OK)
3. The sheet flow travel time is less than 80% of Tc (OK)
4. The sum of shallow-concentrated flow segment lengths is < 1,000 FT (OK)



**Watershed I.D.: Proposed Southerly Detention Watershed**

Estimate Time of Concentration using the "Velocity Method".

Reference: USDA-NRCS National Engineering Handbook - Part 630 -Hydrology; Chapter 15 - Time of Concentration and USDA-NRCS TR-55 - June 1986

**SHEET FLOW**

| Step No. | Data   | Seg. I.D.: | <b>1</b>                | Seg. I.D.: | <b>2</b> |                  |
|----------|--|------------|-------------------------|------------|----------|------------------|
| 1A       | Select Surface Description Identifier (Table 3-1)      |            | <b>I</b>                |            |          |                  |
| 1B       | Surface Description (Table 3-1)                        |            | Woods: Light Underbrush |            |          |                  |
| 2        | Manning's Roughness Coefficient "n" (Table 3-1)        |            | 0.400                   |            |          |                  |
| 3        | Flow Length "L" (FT) - Note: Total L must be <= 100 FT |            | 36                      |            |          |                  |
| 4        | Two-Year 24-Hour Rainfall "P <sub>2</sub> " (Inches)   |            | 3.1                     |            |          |                  |
| 5        | Land Slope "S" (FT / FT)                               |            | 0.030                   |            |          | T <sub>T</sub> = |
| 6        | Travel Time "T <sub>T</sub> " (Hours)                  |            | 0.137                   |            |          | <b>0.137</b>     |

$$T_T = \frac{0.007 \times (n \times L)^{0.8}}{P_2^{0.5} \times S^{0.4}}$$

NRCS TR-55 Table 3-1

| Identifier | Surface Description                              | Manning's "n" |
|------------|--|---------------|
| A          | Smooth Surfaces (Conc., Asph., Grav., Bare Soil) | 0.011         |
| B          | Fallow (No Residue)                              | 0.050         |
| C          | Cultivated Soils (Residue Cover <= 20%)          | 0.060         |
| D          | Cultivated Soils (Residue Cover > 20%)           | 0.170         |
| E          | Grass: Short Grass Prairie                       | 0.150         |
| F          | Grass: Dense Grasses                             | 0.240         |
| G          | Grass: Bermuda Grass                             | 0.410         |
| H          | Range (Natural)                                  | 0.130         |
| I          | Woods: Light Underbrush                          | 0.400         |
| J          | Woods: Dense Underbrush                          | 0.800         |

**SHALLOW CONCENTRATED FLOW**

| Step No. | Data                                     | Segment I.D. |          |          |          |          |          |
|----------|--|--------------|----------|----------|----------|----------|----------|
|          |  | <b>3</b>     | <b>4</b> | <b>5</b> | <b>6</b> | <b>7</b> | <b>8</b> |
| 7        | Surface Description (Paved or Unpaved)   | U            | P        | U        |          |          |          |
| 8        | Flow Length "L" (FT)                     | 149          | 175      | 46       |          |          |          |
| 9        | Watercourse Slope "S" (FT/FT)            | 0.0400       | 0.0200   | 0.0400   |          |          |          |
| 10       | Average Velocity "V" (FT/SEC) Figure 3-1 | 3.23         | 2.87     | 3.23     |          |          |          |
| 11       | Travel Time "T <sub>T</sub> " (Hours)    | 0.013        | 0.017    | 0.004    |          |          |          |

$$T_T = \frac{L}{3600 \times V}$$

Unpaved Condition:  
 $V = 16.1345 \times S^{0.5}$

Paved Condition:  
 $V = 20.3282 \times S^{0.5}$

T<sub>T</sub> = **0.034**



**OPEN CHANNEL FLOW**

Note: Hydraulic properties estimated from the worksheets that follow below.

| Step No.                        | Data                                  | Segment I.D.  |    |    |    |    |    |    |
|---------------------------------|---------------------------------------|---|----|----|----|----|----|----|
|                                 |                                       | 9   | 10 | 11 | 12 | 13 | 14 | 15 |
| 12A                             | Channel or Pipe Flow? (C or P)        |   |    |    |    |    |    |    |
| 12B                             | Cross Sectional Flow Area (SF)        |   |    |    |    |    |    |    |
| 13                              | Wetted Perimeter (FT)                 |   |    |    |    |    |    |    |
| 14                              | Hydraulic Radius (FT)                 |   |    |    |    |    |    |    |
| 14                              | Channel or Pipe Slope (FT/FT)         |   |    |    |    |    |    |    |
| 16                              | Manning's Roughness Coefficient       |   |    |    |    |    |    |    |
| 17                              | Velocity (FT/SEC)                     |   |    |    |    |    |    |    |
| 18                              | Flow Length (L) (FT)                  |   |    |    |    |    |    |    |
| 19                              | Travel Time "T <sub>T</sub> " (Hours) |   |    |    |    |    |    |    |
| $T_T = \frac{L}{3600 \times V}$ |                                       | $T_T =$ <span style="border: 1px solid black; padding: 2px;">0.000</span> |    |    |    |    |    |    |

Step 20: Watershed Time of Concentration (Add T<sub>T</sub> from Steps 6, 11, and 19):

|   |                           |   |   |   |   |
|---|---------------------------|---|---|---|---|
| <u>Step 6:</u>  | <u>Step 11:</u>           | <u>Step 19:</u>   |   |   |   |
| T <sub>T</sub>  | T <sub>T</sub>            | T <sub>T</sub>  |   |   |   |
| Sheet Flow  | Shallow Concentrated Flow | Channel Flow  |   |   |   |
| <span style="border: 1px solid black; padding: 2px;">0.137</span> | +                         | <span style="border: 1px solid black; padding: 2px;">0.034</span> | + | <span style="border: 1px solid black; padding: 2px;">0.000</span> | =   |
|   |                           |   |   |   | <span style="border: 1px solid black; padding: 2px;">0.170</span> Hours                         |
|   |                           |   |   |   | Tc Converted to Minutes: <span style="border: 1px solid black; padding: 2px;">10</span> Minutes |

Notes:

1. The sum of all sheet-flow travel lengths is <= 100 FT as recommended in NRCS NEH Part 630 Chapter 15.
3. The sum of sheet-flow travel length is <= 10% of total hydraulic length (OK)
3. The sheet flow travel time exceeds 80% of Tc. Consider reducing sheet flow length(s).
4. The sum of shallow-concentrated flow segment lengths is < 1,000 FT (OK)



**Runoff Coefficients per ConnDOT Drainage Manual - Chapter 6:**

Table 6-3 - Recommended Coefficients for Pervious Areas:

| Slope         | NRCS Hydrologic Soil Group |             |             |             |
|---------------|----------------------------|-------------|-------------|-------------|
|               | A                          | B           | C           | D           |
| Flat: (0%-1%) | 0.04 - 0.09                | 0.07 - 0.12 | 0.11 - 0.16 | 0.15 - 0.20 |
| Ave.: (2%-6%) | 0.09 - 0.14                | 0.12 - 0.17 | 0.16 - 0.21 | 0.20 - 0.25 |
| Steep: (> 6%) | 0.13 - 0.18                | 0.18 - 0.24 | 0.23 - 0.31 | 0.28 - 0.38 |

Table 6-5 - Runoff Coefficients for Impervious Areas

| Asphalt Streets | Concrete Streets | Drives & Walks | Roofs       |
|-----------------|------------------|----------------|-------------|
| 0.70 - 0.95     | 0.80 - 0.95      | 0.75 - 0.85    | 0.75 - 0.95 |

Table 6-4 - Recommended Coefficients for Various Selected Land Uses:

| Downtown Areas | Neighborhood Areas | Single Family Areas | Multi Units Detached | Multi Units Attached | Suburban    | Residential (>1.2 Ac.) | Apartment Dwelling Areas | Light Industrial Areas | Heavy Industrial Areas | Parks & Cemetery | Playgrounds | Rail Yard Areas | Un-Improved Areas |
|----------------|--------------------|---------------------|----------------------|----------------------|-------------|------------------------|--------------------------|------------------------|------------------------|------------------|-------------|-----------------|-------------------|
| 0.70 - 0.95    | 0.50 - 0.70        | 0.30 - 0.50         | 0.40 - 0.60          | 0.60 - 0.75          | 0.25 - 0.40 | 0.30 - 0.45            | 0.50 - 0.70              | 0.50 - 0.80            | 0.60 - 0.90            | 0.10 - 0.25      | 0.20 - 0.40 | 0.20 - 0.40     | 0.10 - 0.30       |

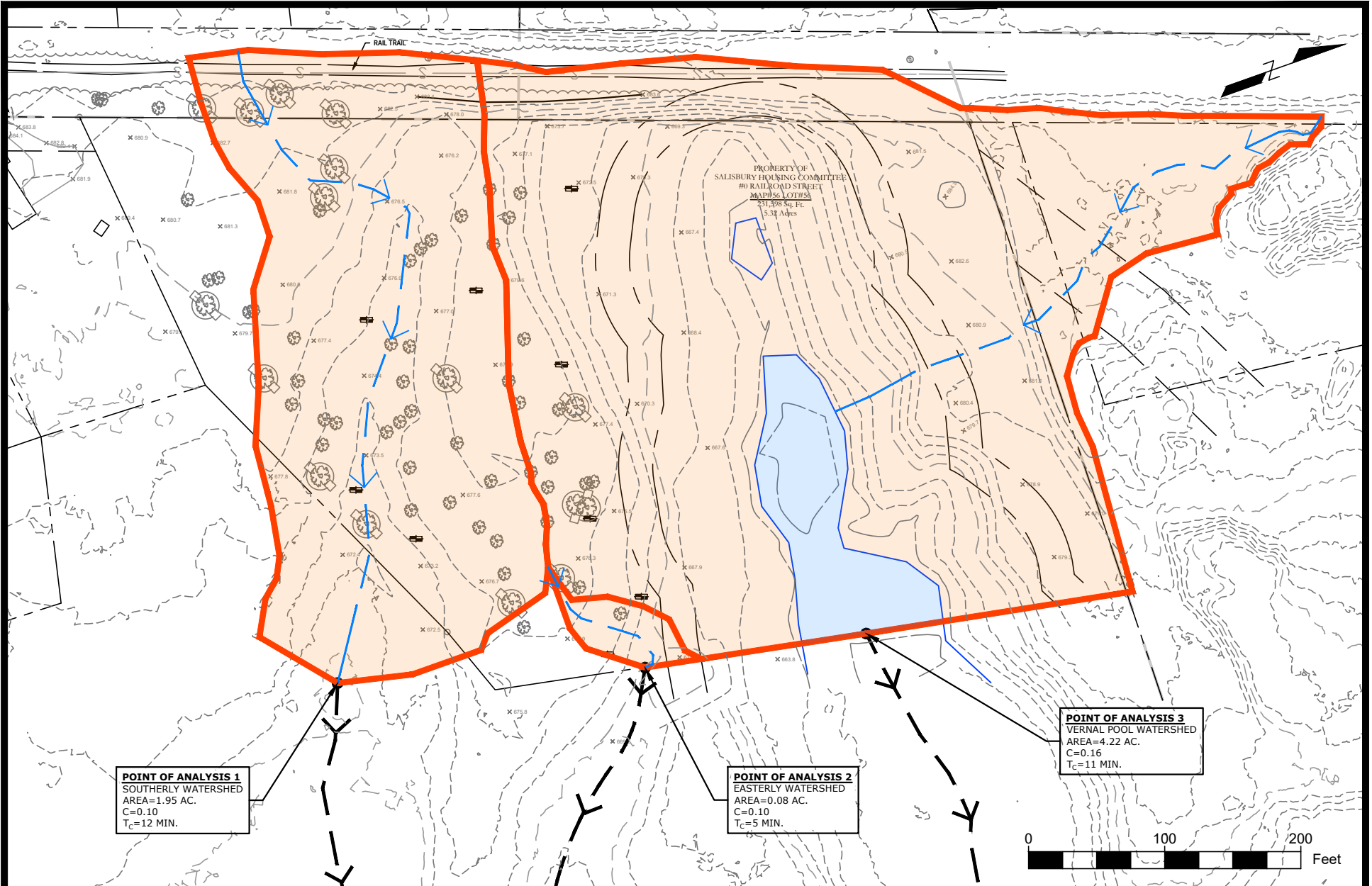
**Calculate Composite Runoff Coefficient and Adjust for Infrequent Storms:**

| Area I.D.                 | Total Area (Acres) | Impervious (Acres)<br>C = 0.90 | Woods HSG-A (Acres)<br>C = 0.10 | Grass HSG-A (Acre)<br>C = 0.25 | Water (Acres)<br>C = 0.90 | Other (Acres)<br>C = | Check S Area (Acres) | S A x C | Composite Runoff Coefficient C' | C <sub>A</sub> - Runoff Coefficient Adjusted for Infrequent Storms |                  |                  |                      |                      |                      |
|---------------------------|--------------------|--------------------------------|---------------------------------|--------------------------------|---------------------------|----------------------|----------------------|---------|---------------------------------|--|------------------|------------------|----------------------|----------------------|----------------------|
|                           |                    |                                |                                 |                                |                           |                      |                      |         |                                 | Recurrence Interval  |                  |                  |                      |                      |                      |
|                           |                    |                                |                                 |                                |                           |                      |                      |         |                                 | 2-Year   | 5-Year           | 10-Year          | 25-Year              | 50-Year              | 100-Year             |
|                           |                    |                                |                                 |                                |                           |                      |                      |         |                                 | C <sub>F</sub> =   | C <sub>F</sub> = | C <sub>F</sub> = | Max.C <sub>F</sub> = | Max.C <sub>F</sub> = | Max.C <sub>F</sub> = |
| <b>Pre-Development</b>    |                    |                                |                                 |                                |                           |                      |                      |         |                                 | <b>1.00</b>  | <b>1.00</b>      | <b>1.00</b>      | <b>1.10</b>          | <b>1.20</b>          | <b>1.25</b>          |
| Ex. Southerly             | 1.95               |                                | 1.95                            |                                |                           |                      | 1.95                 | 0.195   | 0.10                            | 0.10   | 0.10             | 0.10             | 0.11                 | 0.12                 | 0.13                 |
| Ex. Vernal Pool           | 4.22               |                                | 3.91                            |                                | 0.31                      |                      | 4.22                 | 0.670   | 0.16                            | 0.16   | 0.16             | 0.16             | 0.17                 | 0.19                 | 0.20                 |
| Ex. Easterly              | 0.08               |                                | 0.08                            |                                |                           |                      | 0.08                 | 0.008   | 0.10                            | 0.10   | 0.10             | 0.10             | 0.11                 | 0.12                 | 0.13                 |
| <b>Total</b>              | <b>6.25</b>        | <b>0</b>                       | <b>5.94</b>                     | <b>0</b>                       | <b>0.31</b>               |                      |                      |         |                                 |  |                  |                  |                      |                      |                      |
| <b>Post-Development</b>   |                    |                                |                                 |                                |                           |                      |                      |         |                                 |  |                  |                  |                      |                      |                      |
| Pr. Southerly             | 0.49               | 0.00                           | 0.44                            | 0.05                           |                           |                      | 0.49                 | 0.057   | 0.12                            | 0.12   | 0.12             | 0.12             | 0.13                 | 0.14                 | 0.14                 |
| Pr. Southerly Detention   | 1.33               | 0.62                           | 0.2                             | 0.51                           |                           |                      | 1.33                 | 0.706   | 0.53                            | 0.53   | 0.53             | 0.53             | 0.58                 | 0.64                 | 0.66                 |
| Pr. Vernal Pool           | 3.75               | 0.02                           | 3.25                            | 0.17                           | 0.31                      |                      | 3.75                 | 0.665   | 0.18                            | 0.18   | 0.18             | 0.18             | 0.19                 | 0.21                 | 0.22                 |
| Pr. Vernal Pool Detention | 0.55               | 0.1                            | 0.22                            | 0.23                           |                           |                      | 0.55                 | 0.170   | 0.31                            | 0.31   | 0.31             | 0.31             | 0.34                 | 0.37                 | 0.39                 |
| Pr. Easterly              | 0.30               | 0.1                            | 0.1                             | 0.1                            |                           |                      | 0.30                 | 0.125   | 0.42                            | 0.42   | 0.42             | 0.42             | 0.46                 | 0.50                 | 0.52                 |
| <b>Total</b>              | <b>6.42</b>        | <b>0.84</b>                    | <b>4.21</b>                     | <b>1.06</b>                    | <b>0.31</b>               |                      |                      |         |                                 |  |                  |                  |                      |                      |                      |

- (1) Area of individual cover types measured from plans
- (2) Runoff coefficient for individual cover types selected from reference tables above.
- (3) Composite Runoff Coefficient C' = S(A x C) / SA
- (4) Frequency Factors (C<sub>F</sub>) from ConnDOT Drainage Manual 2000 - Table 6-2
- (5) Per ConnDOT Drainage Manual 2000 Section 6.9.5: C<sub>A</sub> = 1.00 where C' \* C<sub>F</sub> >= 1.00 C<sub>A</sub> = C' \* C<sub>F</sub> where C' \* C<sub>F</sub> < 1.00



FILE LOCATION: P:\CT\4010271-QUISENBERRY ARCARI MALIK ARCHITECTS, LLC\23137 - RAILROAD STREET SALISBURY - TAP\02-CAD\_FILES\CIVIL\H&H-UNDERGROUND DETENTION.DWG, 2023.11.20, 9:55 AM

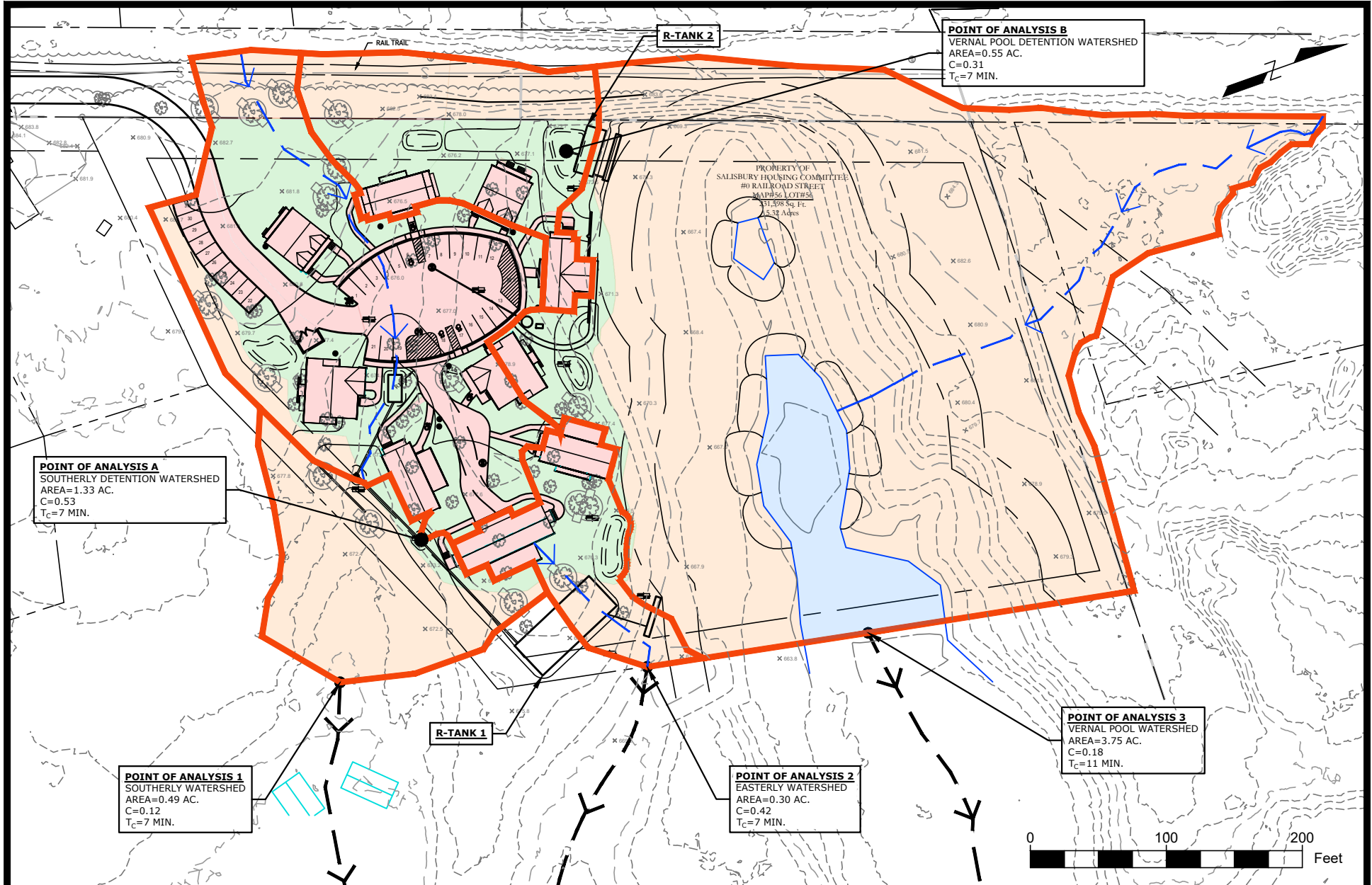


PROJECT  
**DRESSER WOODS**  
RAILROAD STREET - SALISBURY, CT

TITLE  
PRE DEVELOPMENT WATERSHED MAP

|                    |                              |
|--------------------|------------------------------|
| DATE<br>2023.11.20 | PROJECT No.<br>4010271.23137 |
| SCALE<br>AS NOTED  | DRAWING No.                  |
| DRAWN BY<br>CG     |                              |

FILE LOCATION: P:\CT\4010271-QUISENBERRY ARCARI MALIK ARCHITECTS, LLC\23137 - RAILROAD STREET SALISBURY, CT\02-CAD\_FILES\CIVIL\H&H-UNDERGROUND DETENTION.DWG, 2023.11.20, 9:58 AM



PROJECT  
**DRESSER WOODS**  
RAILROAD STREET - SALISBURY, CT

TITLE  
POST DEVELOPMENT WATERSHED MAP

|                    |                              |
|--------------------|------------------------------|
| DATE<br>2023.11.23 | PROJECT No.<br>4010271.23137 |
| SCALE<br>AS NOTED  | DRAWING No.                  |
| DRAWN BY<br>CG     |                              |

## C. Hydrographs

## 2 - Year

|  |          |
|--|----------|
| <b>Hydrograph Reports</b> .....  | <b>1</b> |
| Hydrograph No. 1, Rational, Ex. Southerly.....                         | 1        |
| Hydrograph No. 2, Rational, Ex. Vernal Pool.....                       | 2        |
| Hydrograph No. 3, Rational, Ex. Easterly.....                          | 3        |
| Hydrograph No. 4, Combine, Pre-Development Runoff.....                 | 4        |
| Hydrograph No. 5, Rational, Pr. Southerly Detention.....               | 5        |
| Hydrograph No. 6, Rational, Pr. Southerly.....                         | 6        |
| Hydrograph No. 7, Reservoir, R-Tank 1.....                             | 7        |
| Hydrograph No. 8, Rational, Pr. Easterly.....                          | 8        |
| Hydrograph No. 9, Combine, R-Tank discharge to Easterly Watershed..... | 9        |
| Hydrograph No. 10, Rational, Pr. Vernal Pool.....                      | 10       |
| Hydrograph No. 11, Rational, Pr. Vernal Pool Detention.....            | 11       |
| Hydrograph No. 12, Reservoir, R-Tank 2.....                            | 12       |
| Hydrograph No. 13, Combine, R-Tank Discharge to Pr. Vernal Pool.....   | 13       |
| Hydrograph No. 14, Combine, Post-Development Runoff.....               | 14       |

## 10 - Year

|  |           |
|--|-----------|
| <b>Hydrograph Reports</b> .....  | <b>15</b> |
| Hydrograph No. 1, Rational, Ex. Southerly.....                         | 15        |
| Hydrograph No. 2, Rational, Ex. Vernal Pool.....                       | 16        |
| Hydrograph No. 3, Rational, Ex. Easterly.....                          | 17        |
| Hydrograph No. 4, Combine, Pre-Development Runoff.....                 | 18        |
| Hydrograph No. 5, Rational, Pr. Southerly Detention.....               | 19        |
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| Hydrograph No. 7, Reservoir, R-Tank 1.....                             | 21        |
| Hydrograph No. 8, Rational, Pr. Easterly.....                          | 22        |
| Hydrograph No. 9, Combine, R-Tank discharge to Easterly Watershed..... | 23        |
| Hydrograph No. 10, Rational, Pr. Vernal Pool.....                      | 24        |
| Hydrograph No. 11, Rational, Pr. Vernal Pool Detention.....            | 25        |
| Hydrograph No. 12, Reservoir, R-Tank 2.....                            | 26        |
| Hydrograph No. 13, Combine, R-Tank Discharge to Pr. Vernal Pool.....   | 27        |
| Hydrograph No. 14, Combine, Post-Development Runoff.....               | 28        |

## 25 - Year

|  |           |
|--|-----------|
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| Hydrograph No. 2, Rational, Ex. Vernal Pool.....                       | 30        |
| Hydrograph No. 3, Rational, Ex. Easterly.....                          | 31        |
| Hydrograph No. 4, Combine, Pre-Development Runoff.....                 | 32        |
| Hydrograph No. 5, Rational, Pr. Southerly Detention.....               | 33        |
| Hydrograph No. 6, Rational, Pr. Southerly.....                         | 34        |
| Hydrograph No. 7, Reservoir, R-Tank 1.....                             | 35        |
| Hydrograph No. 8, Rational, Pr. Easterly.....                          | 36        |
| Hydrograph No. 9, Combine, R-Tank discharge to Easterly Watershed..... | 37        |
| Hydrograph No. 10, Rational, Pr. Vernal Pool.....                      | 38        |
| Hydrograph No. 11, Rational, Pr. Vernal Pool Detention.....            | 39        |
| Hydrograph No. 12, Reservoir, R-Tank 2.....                            | 40        |
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Hydrograph No. 14, Combine, Post-Development Runoff..... 42

**50 - Year**

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Hydrograph No. 2, Rational, Ex. Vernal Pool..... 44

Hydrograph No. 3, Rational, Ex. Easterly..... 45

Hydrograph No. 4, Combine, Pre-Development Runoff..... 46

Hydrograph No. 5, Rational, Pr. Southerly Detention..... 47

Hydrograph No. 6, Rational, Pr. Southerly..... 48

Hydrograph No. 7, Reservoir, R-Tank 1..... 49

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Hydrograph No. 9, Combine, R-Tank discharge to Easterly Watershed..... 51

Hydrograph No. 10, Rational, Pr. Vernal Pool..... 52

Hydrograph No. 11, Rational, Pr. Vernal Pool Detention..... 53

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**100 - Year**

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Hydrograph No. 2, Rational, Ex. Vernal Pool..... 58

Hydrograph No. 3, Rational, Ex. Easterly..... 59

Hydrograph No. 4, Combine, Pre-Development Runoff..... 60

Hydrograph No. 5, Rational, Pr. Southerly Detention..... 61

Hydrograph No. 6, Rational, Pr. Southerly..... 62

Hydrograph No. 7, Reservoir, R-Tank 1..... 63

Hydrograph No. 8, Rational, Pr. Easterly..... 64

Hydrograph No. 9, Combine, R-Tank discharge to Easterly Watershed..... 65

Hydrograph No. 10, Rational, Pr. Vernal Pool..... 66

Hydrograph No. 11, Rational, Pr. Vernal Pool Detention..... 67

Hydrograph No. 12, Reservoir, R-Tank 2..... 68

Hydrograph No. 13, Combine, R-Tank Discharge to Pr. Vernal Pool..... 69

Hydrograph No. 14, Combine, Post-Development Runoff..... 70

# Hydrograph Report

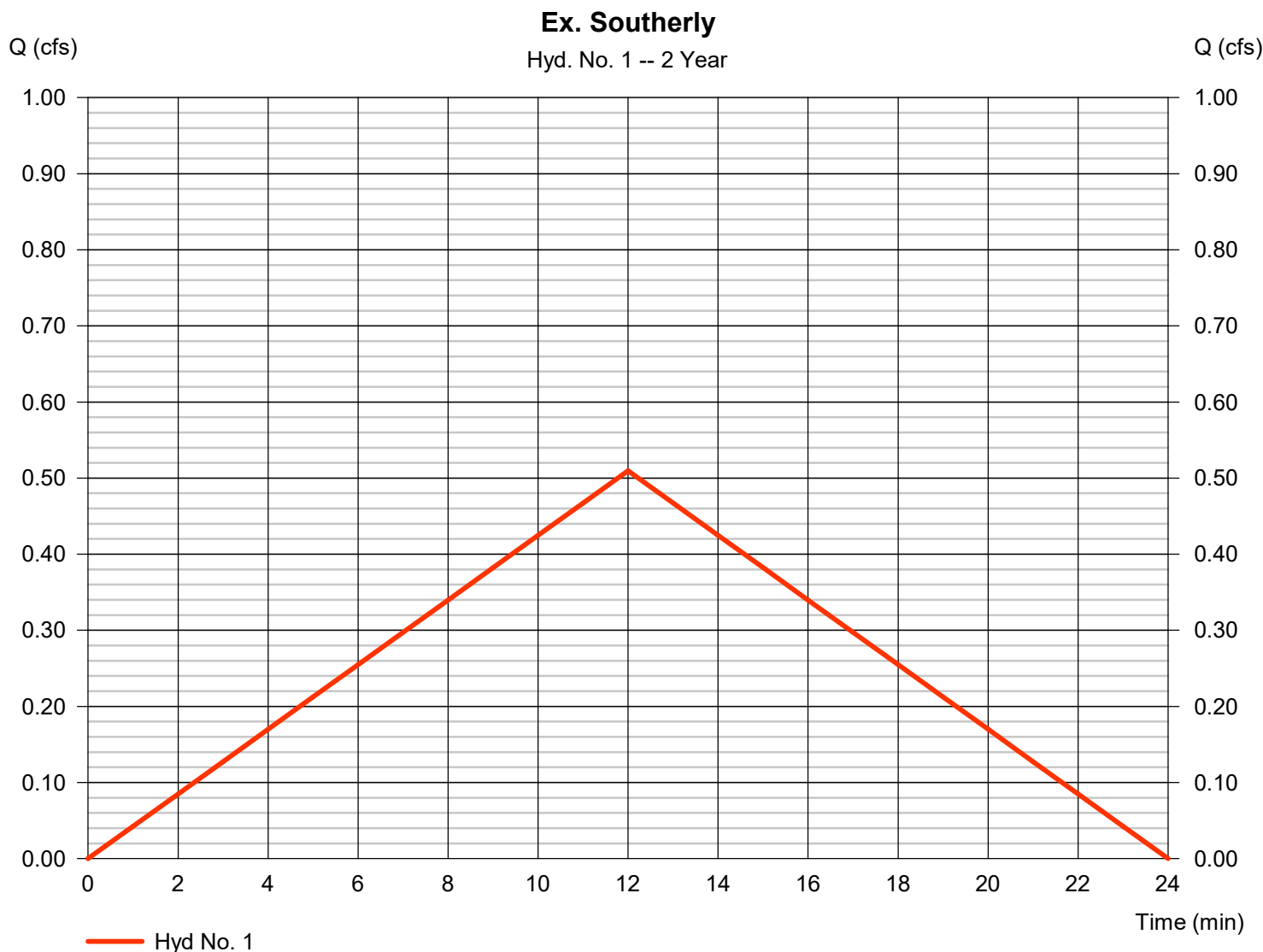
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Monday, 11 / 20 / 2023

## Hyd. No. 1

Ex. Southerly

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge | = 0.510 cfs |
| Storm frequency | = 2 yrs                          | Time to peak   | = 12 min    |
| Time interval   | = 1 min                          | Hyd. volume    | = 367 cuft  |
| Drainage area   | = 1.950 ac                       | Runoff coeff.  | = 0.1       |
| Intensity       | = 2.614 in/hr                    | Tc by User     | = 12.00 min |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revol/Dfact | = 1/1       |

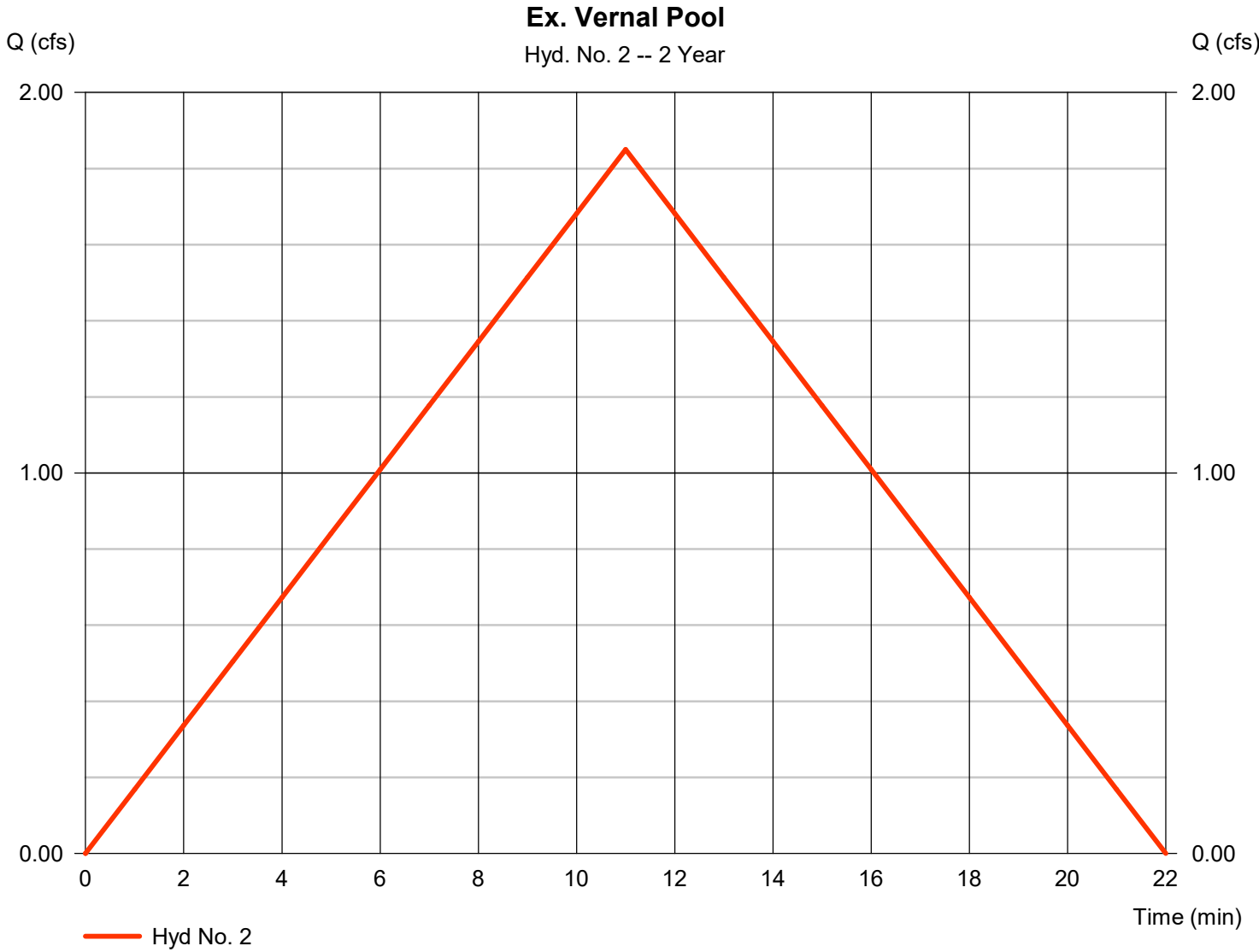


# Hydrograph Report

## Hyd. No. 2

Ex. Vernal Pool

|                 |                                  |                |              |
|-----------------|----------------------------------|----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge | = 1.850 cfs  |
| Storm frequency | = 2 yrs                          | Time to peak   | = 11 min     |
| Time interval   | = 1 min                          | Hyd. volume    | = 1,221 cuft |
| Drainage area   | = 4.220 ac                       | Runoff coeff.  | = 0.16       |
| Intensity       | = 2.740 in/hr                    | Tc by User     | = 11.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Coef. IDF   | = 1/1        |



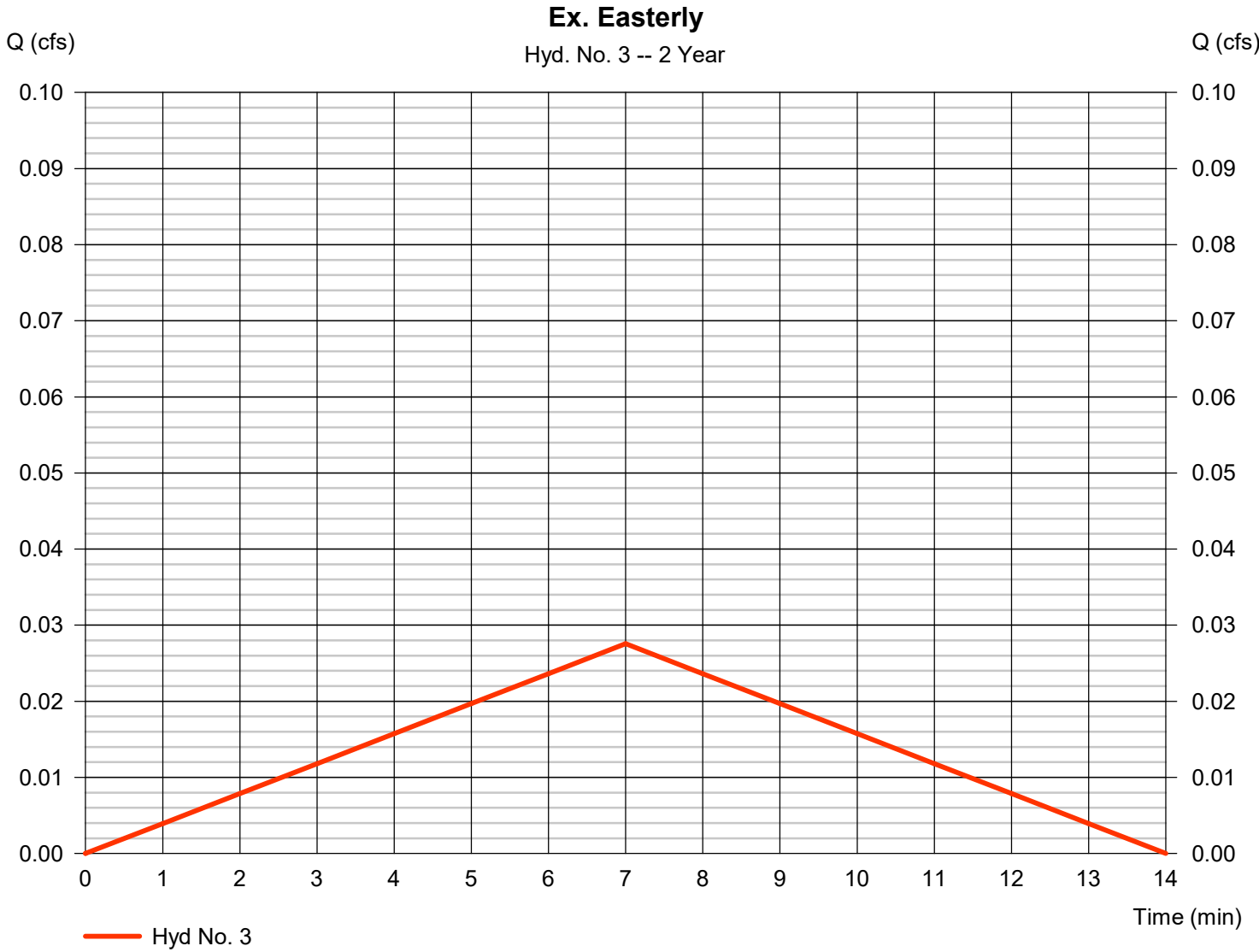


# Hydrograph Report

## Hyd. No. 3

Ex. Easterly

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 0.028 cfs |
| Storm frequency | = 2 yrs                          | Time to peak    | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 12 cuft   |
| Drainage area   | = 0.080 ac                       | Runoff coeff.   | = 0.1       |
| Intensity       | = 3.445 in/hr                    | Tc by User      | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |



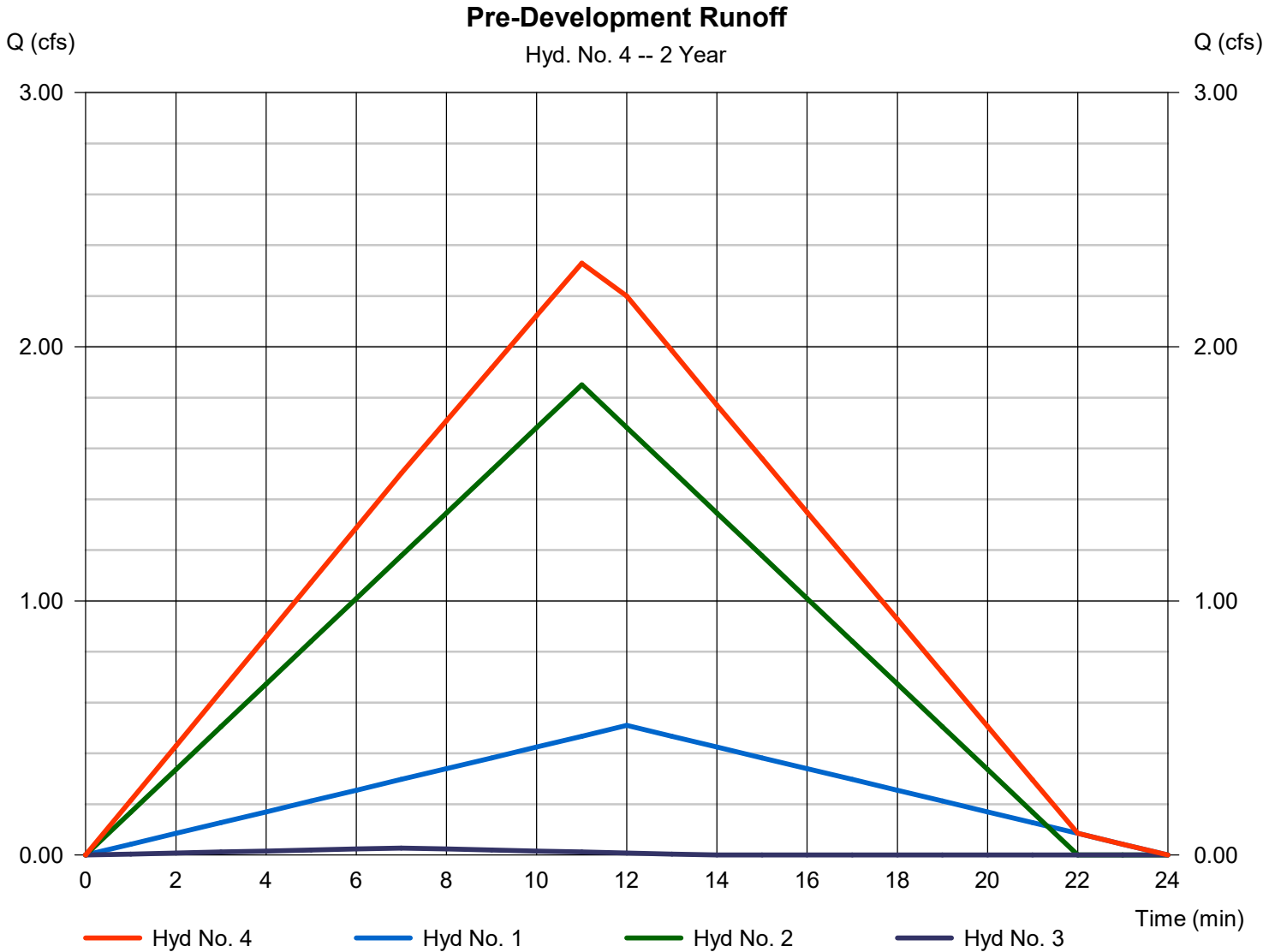


# Hydrograph Report

## Hyd. No. 4

### Pre-Development Runoff

|                 |           |                      |              |
|-----------------|-----------|----------------------|--------------|
| Hydrograph type | = Combine | Peak discharge       | = 2.329 cfs  |
| Storm frequency | = 2 yrs   | Time to peak         | = 11 min     |
| Time interval   | = 1 min   | Hyd. volume          | = 1,600 cuft |
| Inflow hyds.    | = 1, 2, 3 | Contrib. drain. area | = 6.250 ac   |



# Hydrograph Report

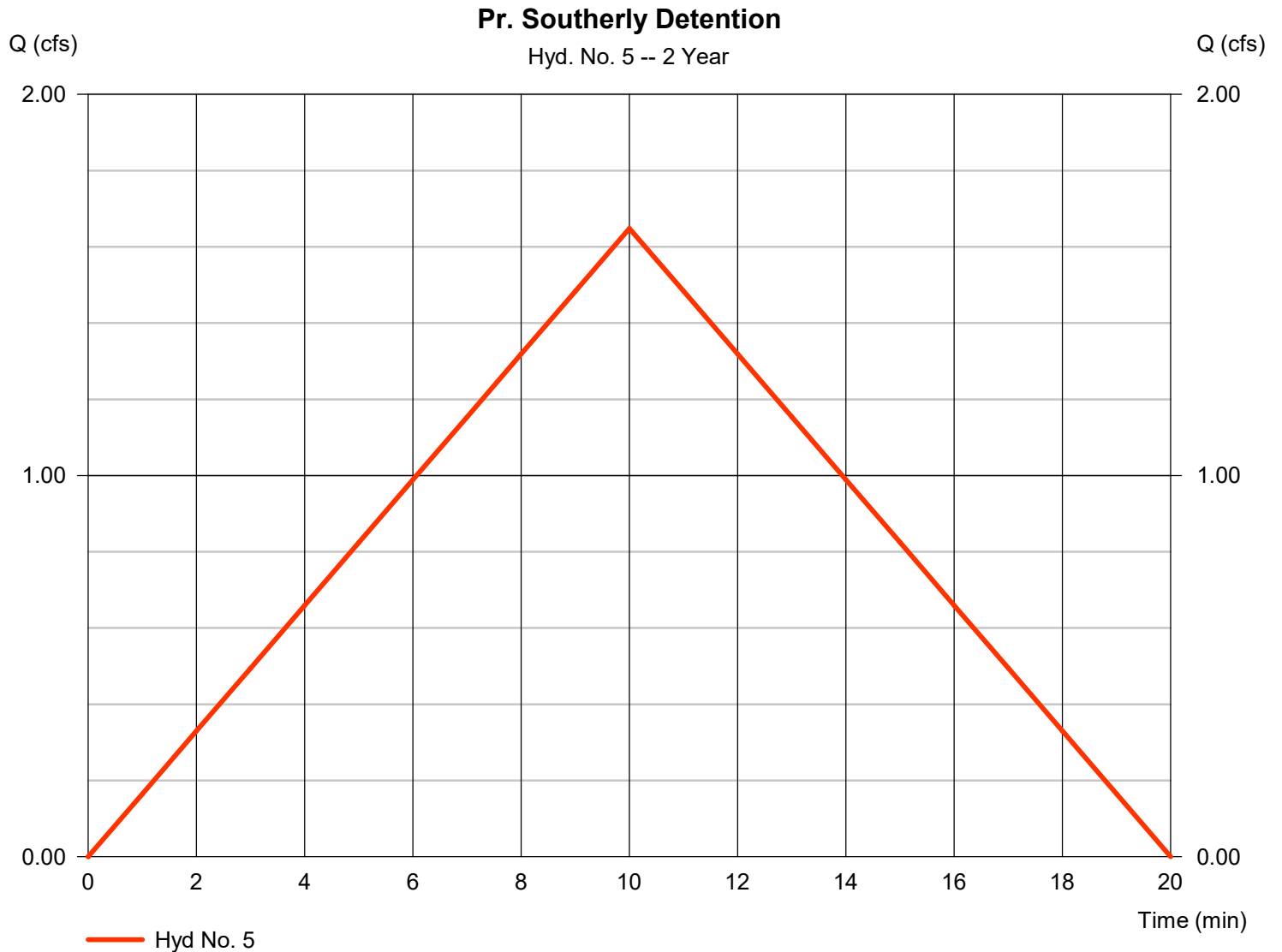
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Monday, 11 / 20 / 2023

## Hyd. No. 5

Pr. Southerly Detention

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 1.648 cfs |
| Storm frequency | = 2 yrs                          | Time to peak    | = 10 min    |
| Time interval   | = 1 min                          | Hyd. volume     | = 989 cuft  |
| Drainage area   | = 1.330 ac                       | Runoff coeff.   | = 0.43      |
| Intensity       | = 2.882 in/hr                    | Tc by User      | = 10.00 min |
| IDF Curve       | = Railroad Street, Salisbury, CT | Ce/Cov/IDF fact | = 1/1       |



# Hydrograph Report

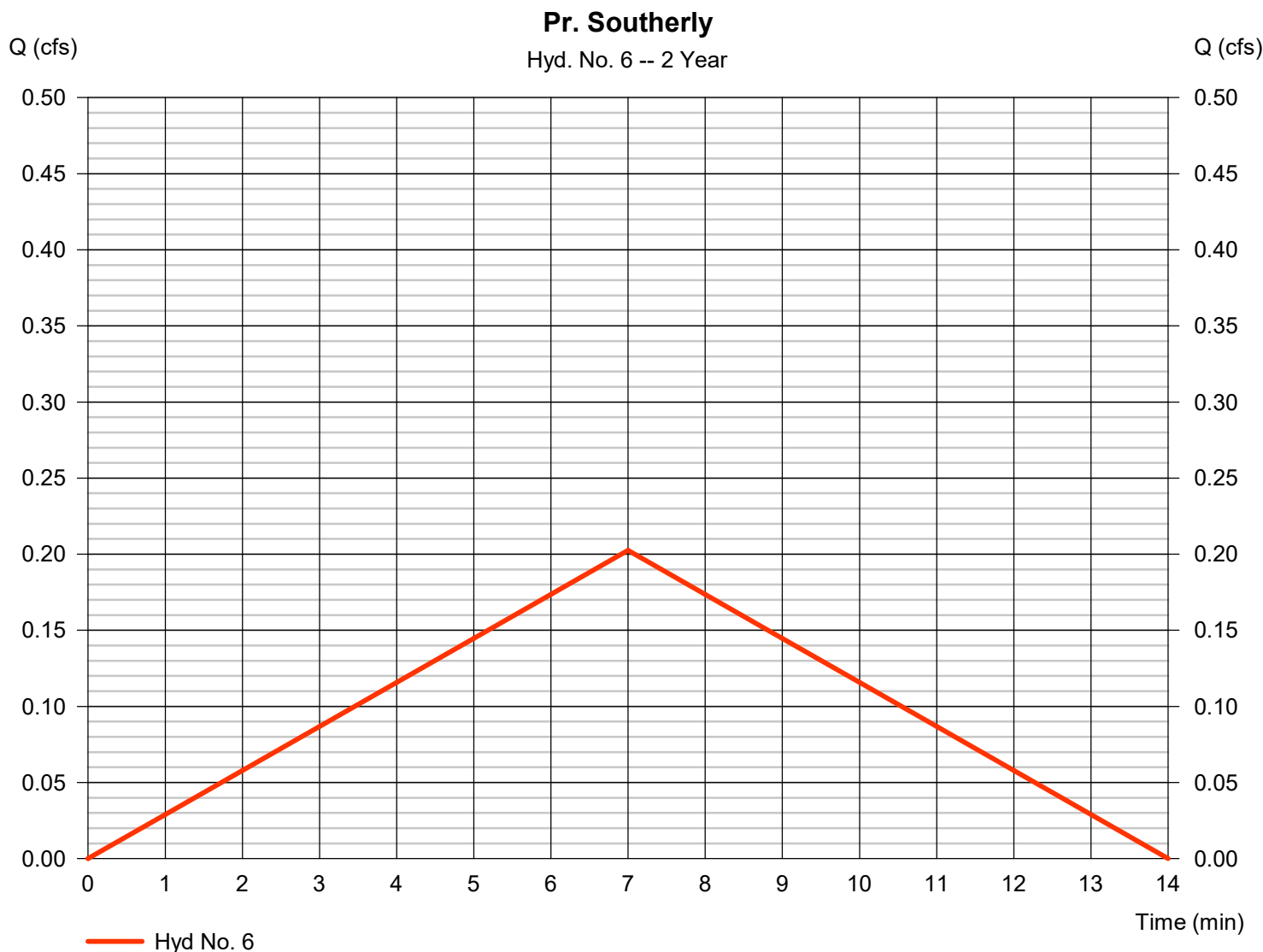
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Monday, 11 / 20 / 2023

## Hyd. No. 6

Pr. Southerly

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 0.203 cfs |
| Storm frequency | = 2 yrs                          | Time to peak    | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 85 cuft   |
| Drainage area   | = 0.490 ac                       | Runoff coeff.   | = 0.12      |
| Intensity       | = 3.445 in/hr                    | Tc by User      | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |



# Hydrograph Report

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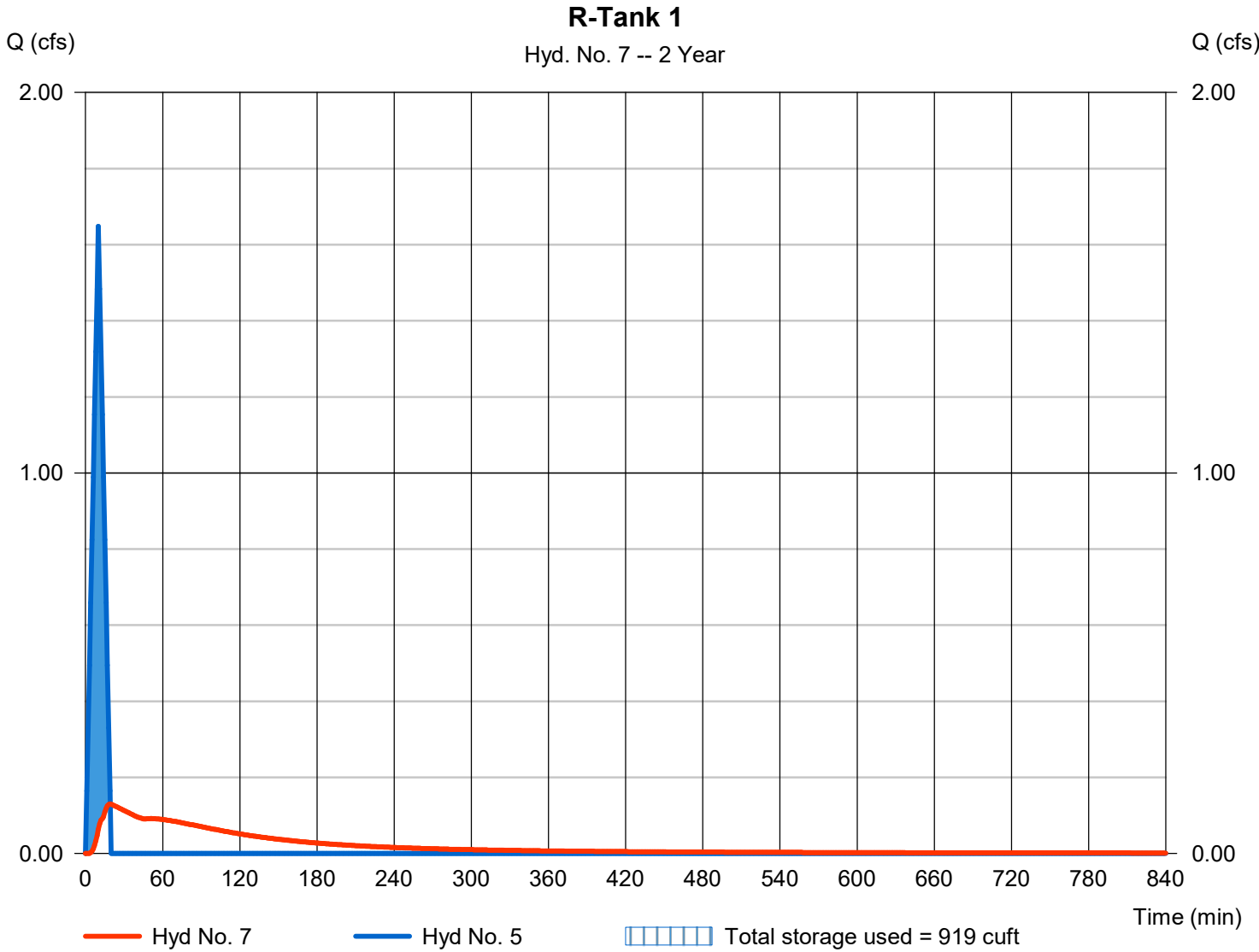
Monday, 11 / 20 / 2023

## Hyd. No. 7

R-Tank 1

|                 |                                |                |             |
|-----------------|--------------------------------|----------------|-------------|
| Hydrograph type | = Reservoir                    | Peak discharge | = 0.130 cfs |
| Storm frequency | = 2 yrs                        | Time to peak   | = 19 min    |
| Time interval   | = 1 min                        | Hyd. volume    | = 941 cuft  |
| Inflow hyd. No. | = 5 - Pr. Southerly Detention  | Max. Elevation | = 672.91 ft |
| Reservoir name  | = Southerly Watershed R-Tank 1 | Max. Storage   | = 919 cuft  |

Storage Indication method used.



# Hydrograph Report

## Hyd. No. 8

Pr. Easterly

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge | = 0.434 cfs |
| Storm frequency | = 2 yrs                          | Time to peak   | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume    | = 182 cuft  |
| Drainage area   | = 0.300 ac                       | Runoff coeff.  | = 0.42      |
| Intensity       | = 3.445 in/hr                    | Tc by User     | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Coef/Dfact  | = 1/1       |



# Hydrograph Report

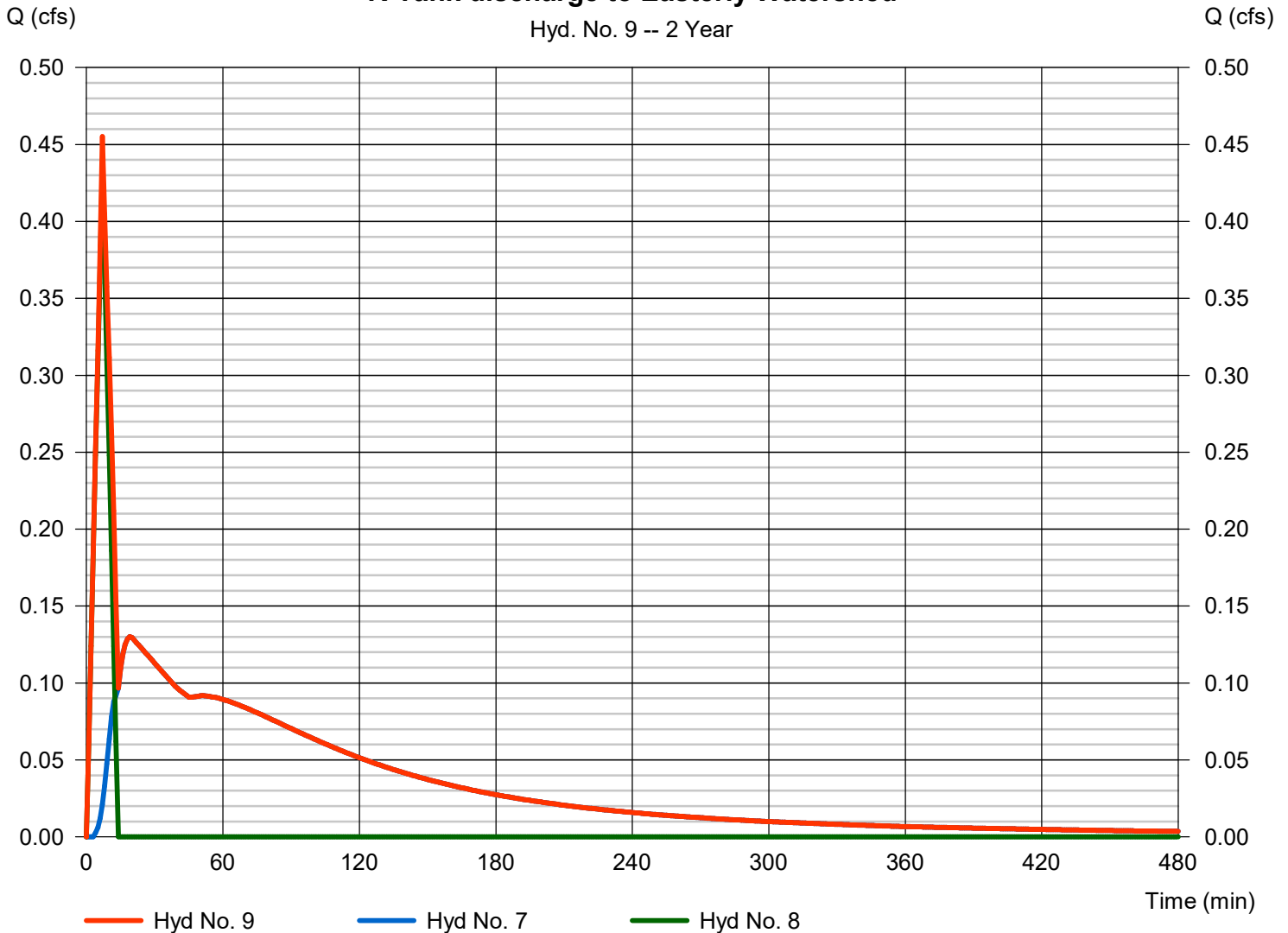
## Hyd. No. 9

R-Tank discharge to Easterly Watershed

|                 |           |                      |              |
|-----------------|-----------|----------------------|--------------|
| Hydrograph type | = Combine | Peak discharge       | = 0.455 cfs  |
| Storm frequency | = 2 yrs   | Time to peak         | = 7 min      |
| Time interval   | = 1 min   | Hyd. volume          | = 1,123 cuft |
| Inflow hyds.    | = 7, 8    | Contrib. drain. area | = 0.300 ac   |

### R-Tank discharge to Easterly Watershed

Hyd. No. 9 -- 2 Year



# Hydrograph Report

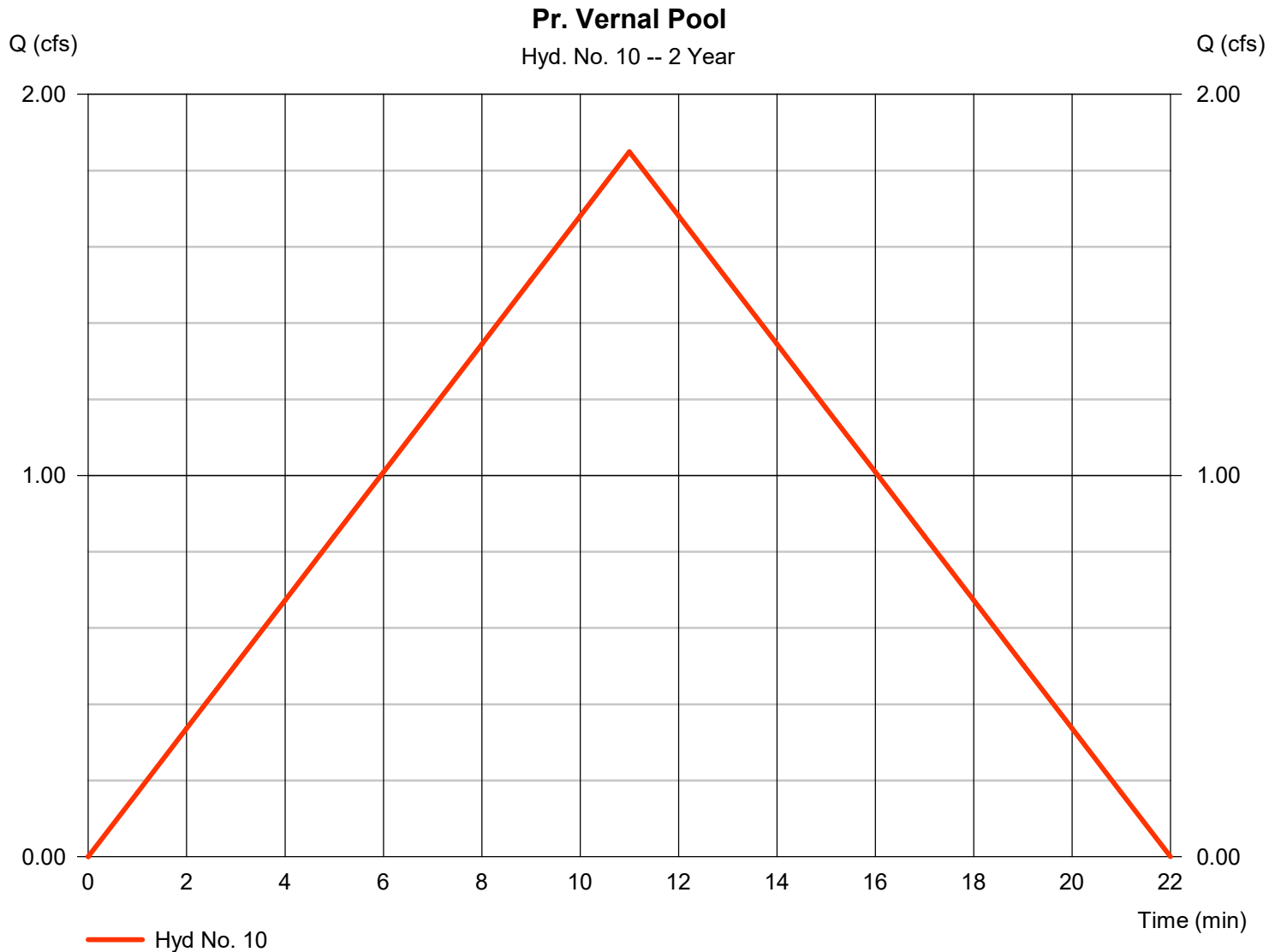
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 10

Pr. Vernal Pool

|                 |                                  |                 |              |
|-----------------|----------------------------------|-----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 1.850 cfs  |
| Storm frequency | = 2 yrs                          | Time to peak    | = 11 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 1,221 cuft |
| Drainage area   | = 3.750 ac                       | Runoff coeff.   | = 0.18       |
| Intensity       | = 2.740 in/hr                    | Tc by User      | = 11.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1        |

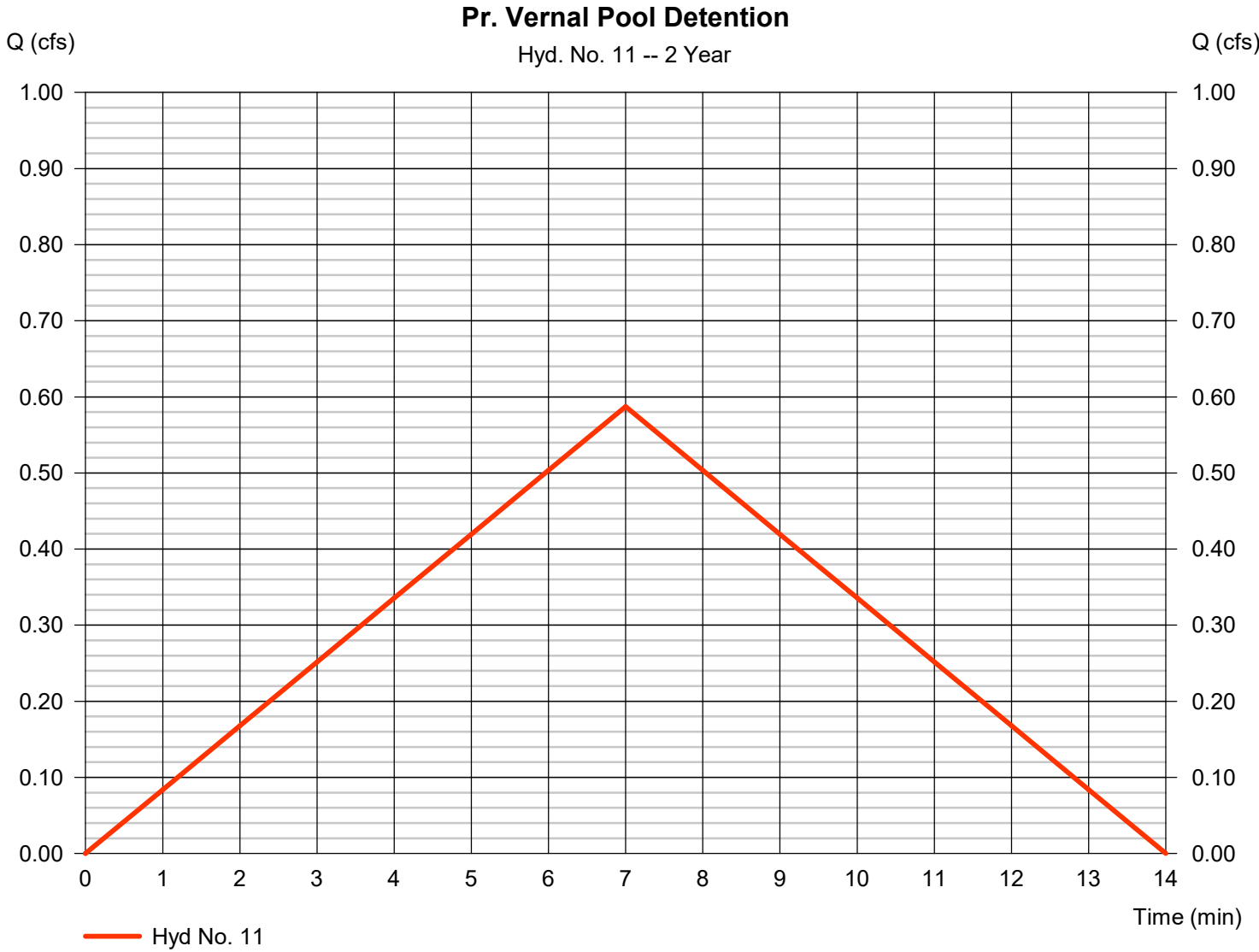


# Hydrograph Report

## Hyd. No. 11

Pr. Vernal Pool Detention

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 0.587 cfs |
| Storm frequency | = 2 yrs                          | Time to peak    | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 247 cuft  |
| Drainage area   | = 0.550 ac                       | Runoff coeff.   | = 0.31      |
| Intensity       | = 3.445 in/hr                    | Tc by User      | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |





# Hydrograph Report

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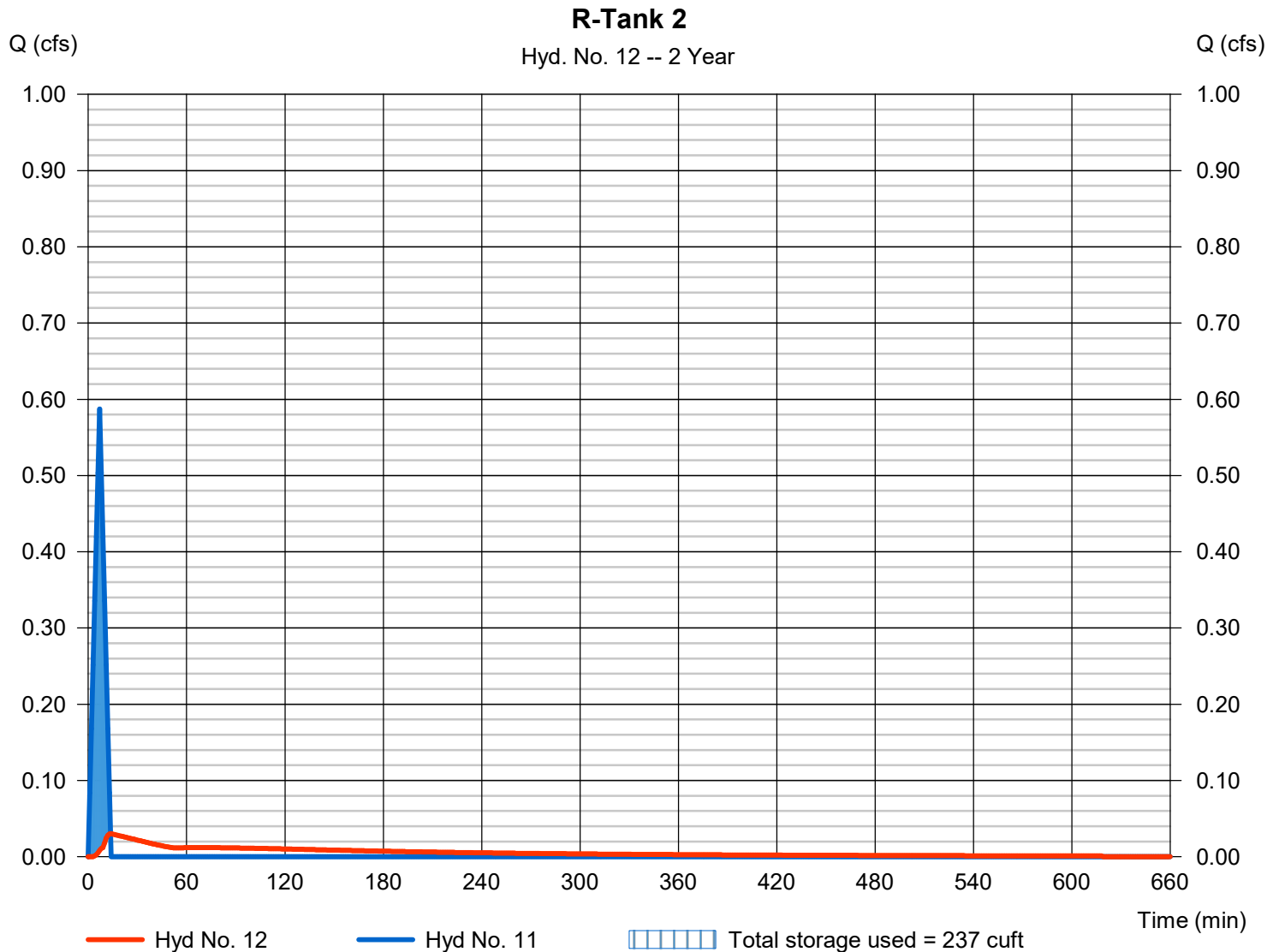
Monday, 11 / 20 / 2023

## Hyd. No. 12

R-Tank 2

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Reservoir                      | Peak discharge | = 0.030 cfs |
| Storm frequency | = 2 yrs                          | Time to peak   | = 14 min    |
| Time interval   | = 1 min                          | Hyd. volume    | = 208 cuft  |
| Inflow hyd. No. | = 11 - Pr. Vernal Pool Detention | Max. Elevation | = 671.91 ft |
| Reservoir name  | = Vernal Pool Watershed R-Tank 2 | Max. Storage   | = 237 cuft  |

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

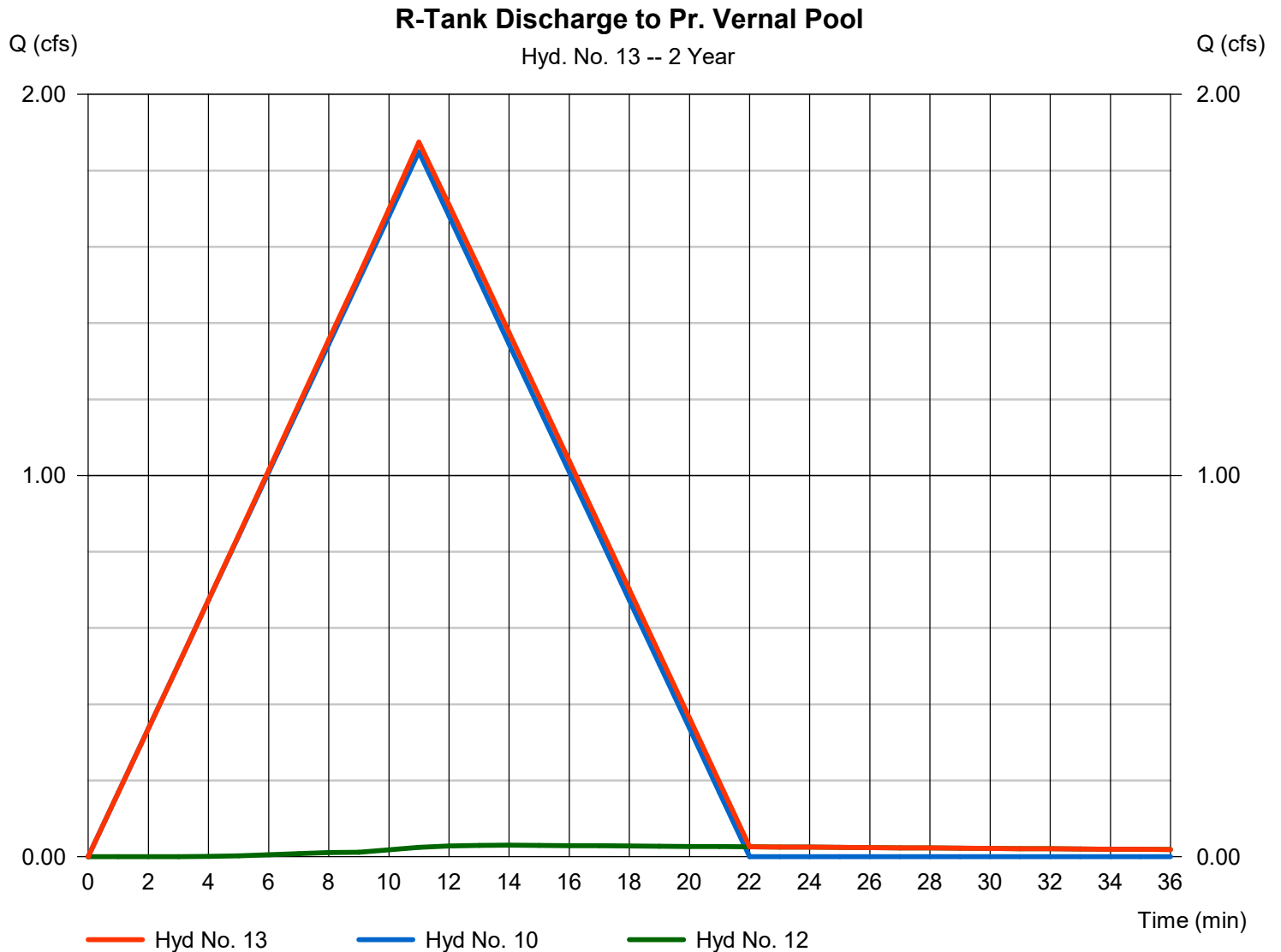
Monday, 11 / 20 / 2023

## Hyd. No. 13

R-Tank Discharge to Pr. Vernal Pool

Hydrograph type = Combine  
Storm frequency = 2 yrs  
Time interval = 1 min  
Inflow hyds. = 10, 12

Peak discharge = 1.874 cfs  
Time to peak = 11 min  
Hyd. volume = 1,429 cuft  
Contrib. drain. area = 3.750 ac



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

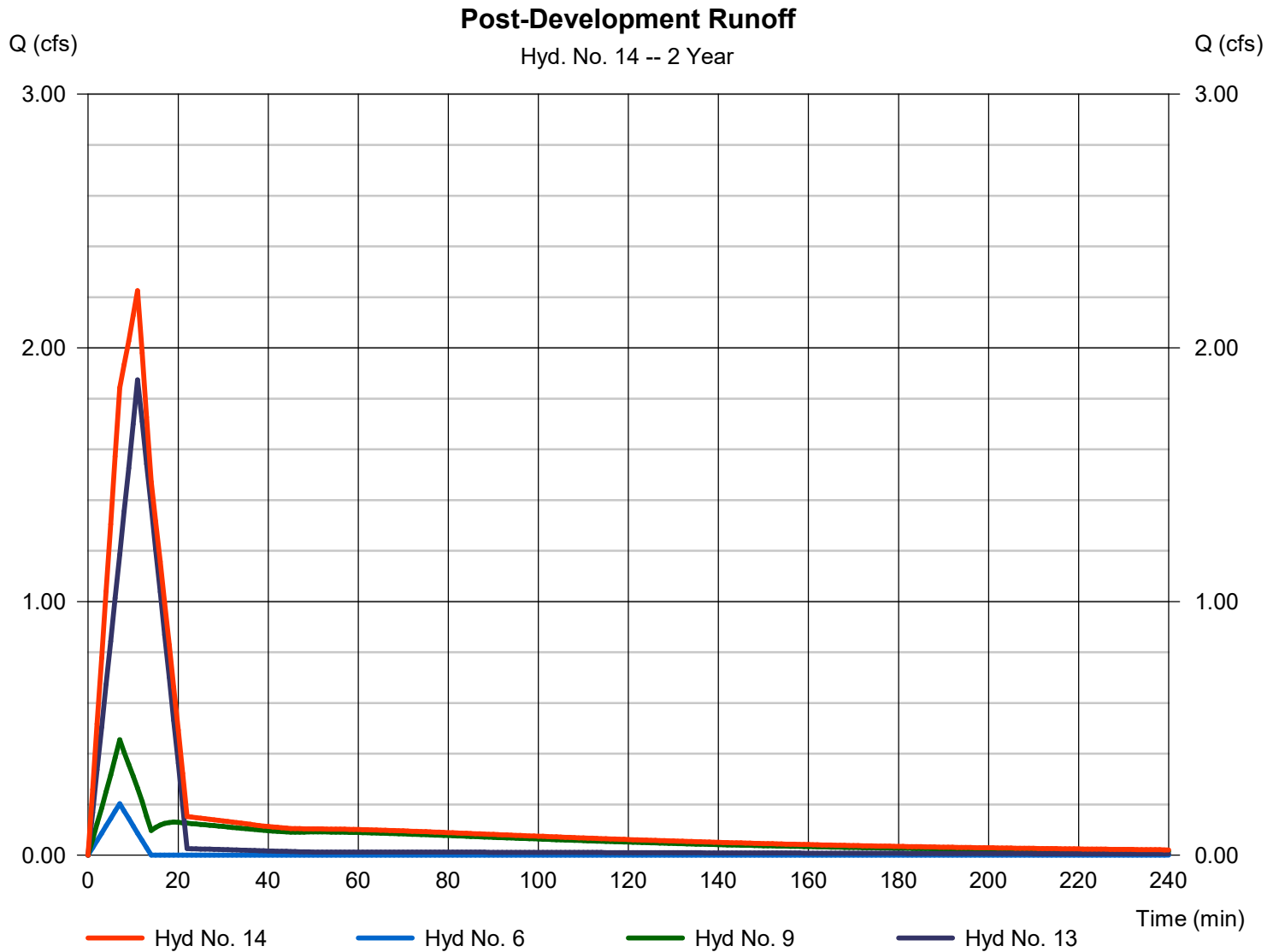
Monday, 11 / 20 / 2023

## Hyd. No. 14

### Post-Development Runoff

Hydrograph type = Combine  
Storm frequency = 2 yrs  
Time interval = 1 min  
Inflow hyds. = 6, 9, 13

Peak discharge = 2.225 cfs  
Time to peak = 11 min  
Hyd. volume = 2,637 cuft  
Contrib. drain. area = 0.490 ac



# Hydrograph Report

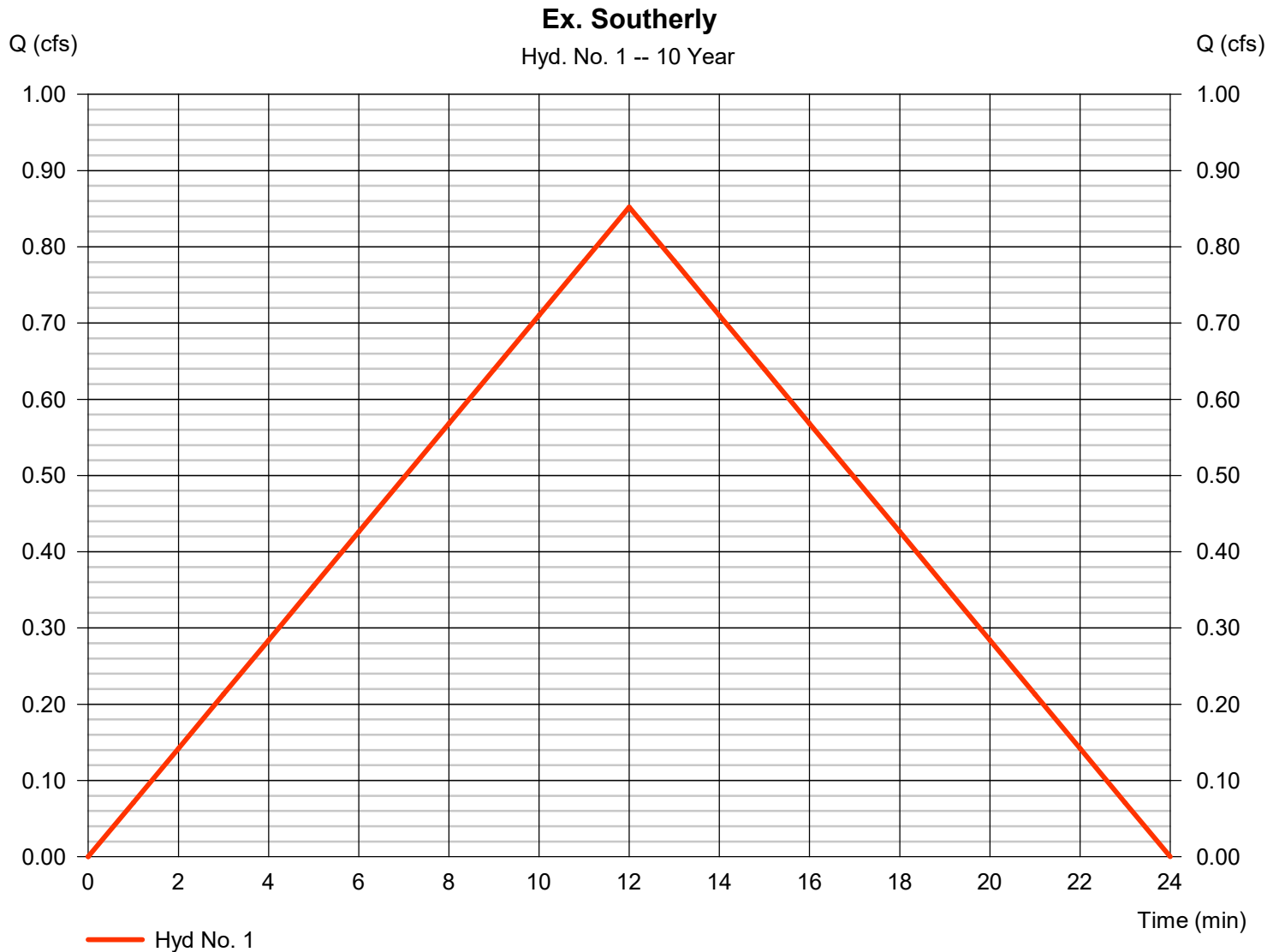
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 1

Ex. Southerly

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge | = 0.852 cfs |
| Storm frequency | = 10 yrs                         | Time to peak   | = 12 min    |
| Time interval   | = 1 min                          | Hyd. volume    | = 614 cuft  |
| Drainage area   | = 1.950 ac                       | Runoff coeff.  | = 0.1       |
| Intensity       | = 4.371 in/hr                    | Tc by User     | = 12.00 min |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revol/Dfact | = 1/1       |



# Hydrograph Report

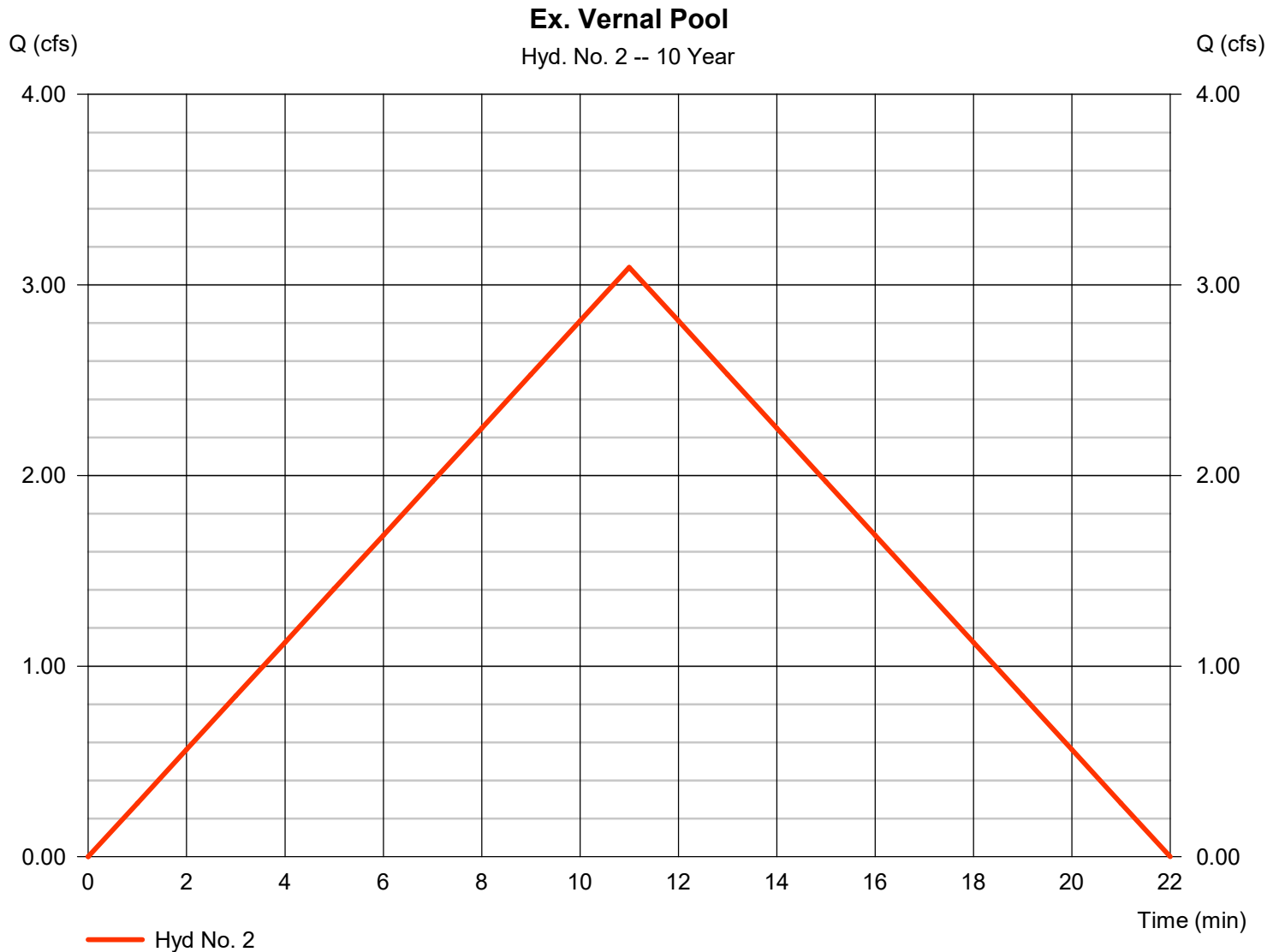
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 2

Ex. Vernal Pool

|                 |                                  |                 |              |
|-----------------|----------------------------------|-----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 3.092 cfs  |
| Storm frequency | = 10 yrs                         | Time to peak    | = 11 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 2,041 cuft |
| Drainage area   | = 4.220 ac                       | Runoff coeff.   | = 0.16       |
| Intensity       | = 4.580 in/hr                    | Tc by User      | = 11.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1        |



# Hydrograph Report

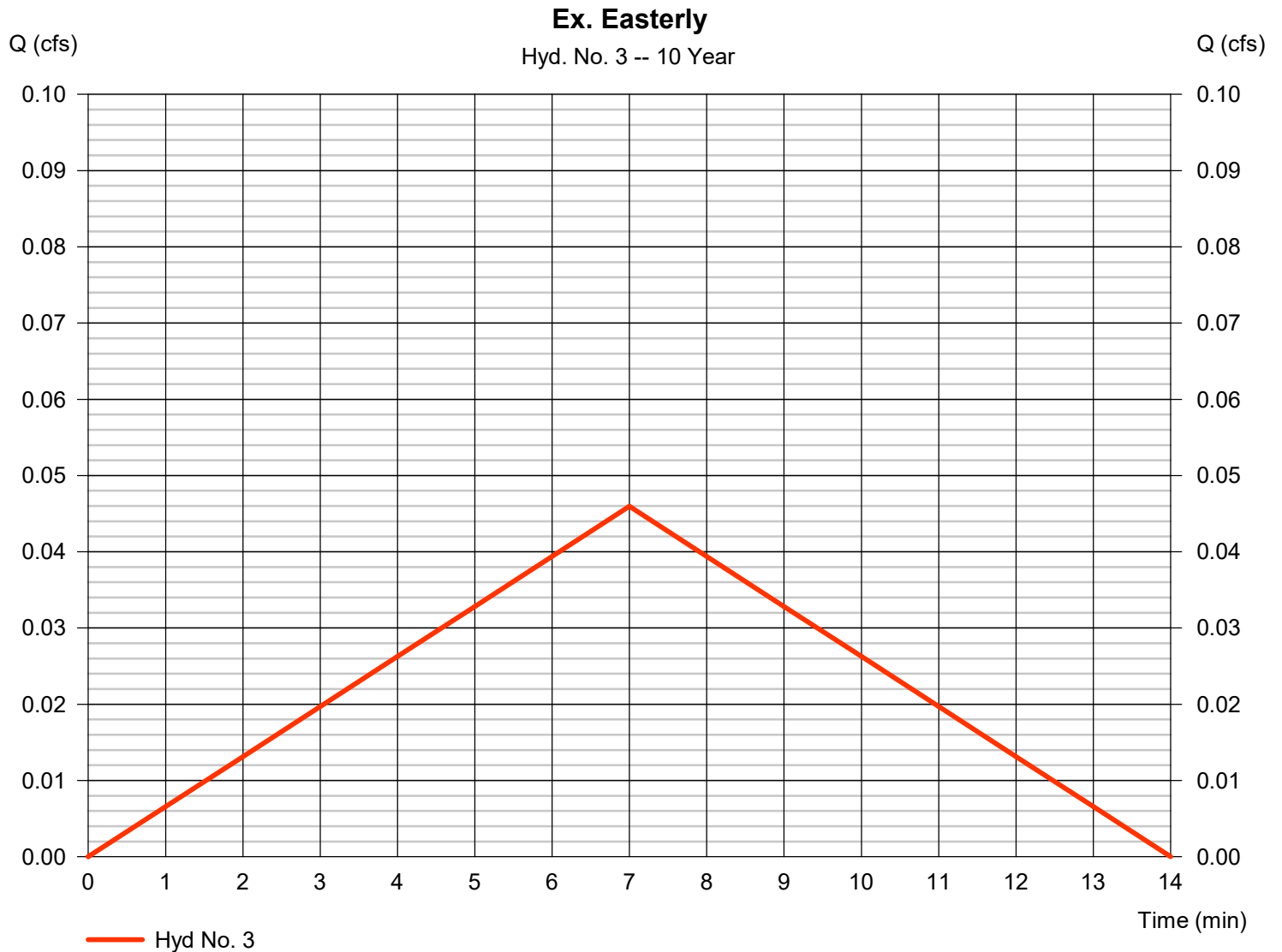
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 3

Ex. Easterly

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 0.046 cfs |
| Storm frequency | = 10 yrs                         | Time to peak    | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 19 cuft   |
| Drainage area   | = 0.080 ac                       | Runoff coeff.   | = 0.1       |
| Intensity       | = 5.745 in/hr                    | Tc by User      | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

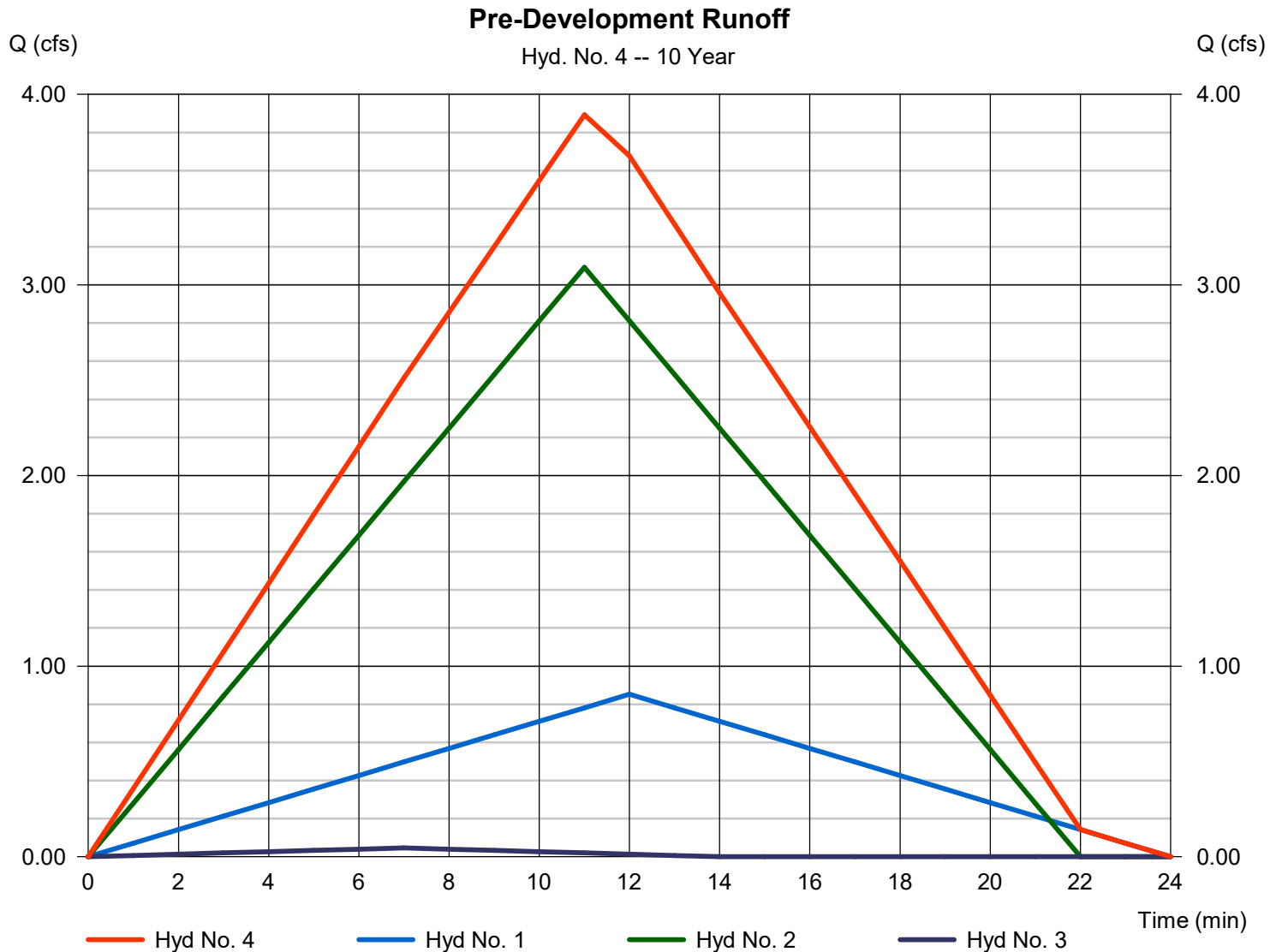
Monday, 11 / 20 / 2023

## Hyd. No. 4

### Pre-Development Runoff

Hydrograph type = Combine  
Storm frequency = 10 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2, 3

Peak discharge = 3.893 cfs  
Time to peak = 11 min  
Hyd. volume = 2,674 cuft  
Contrib. drain. area = 6.250 ac

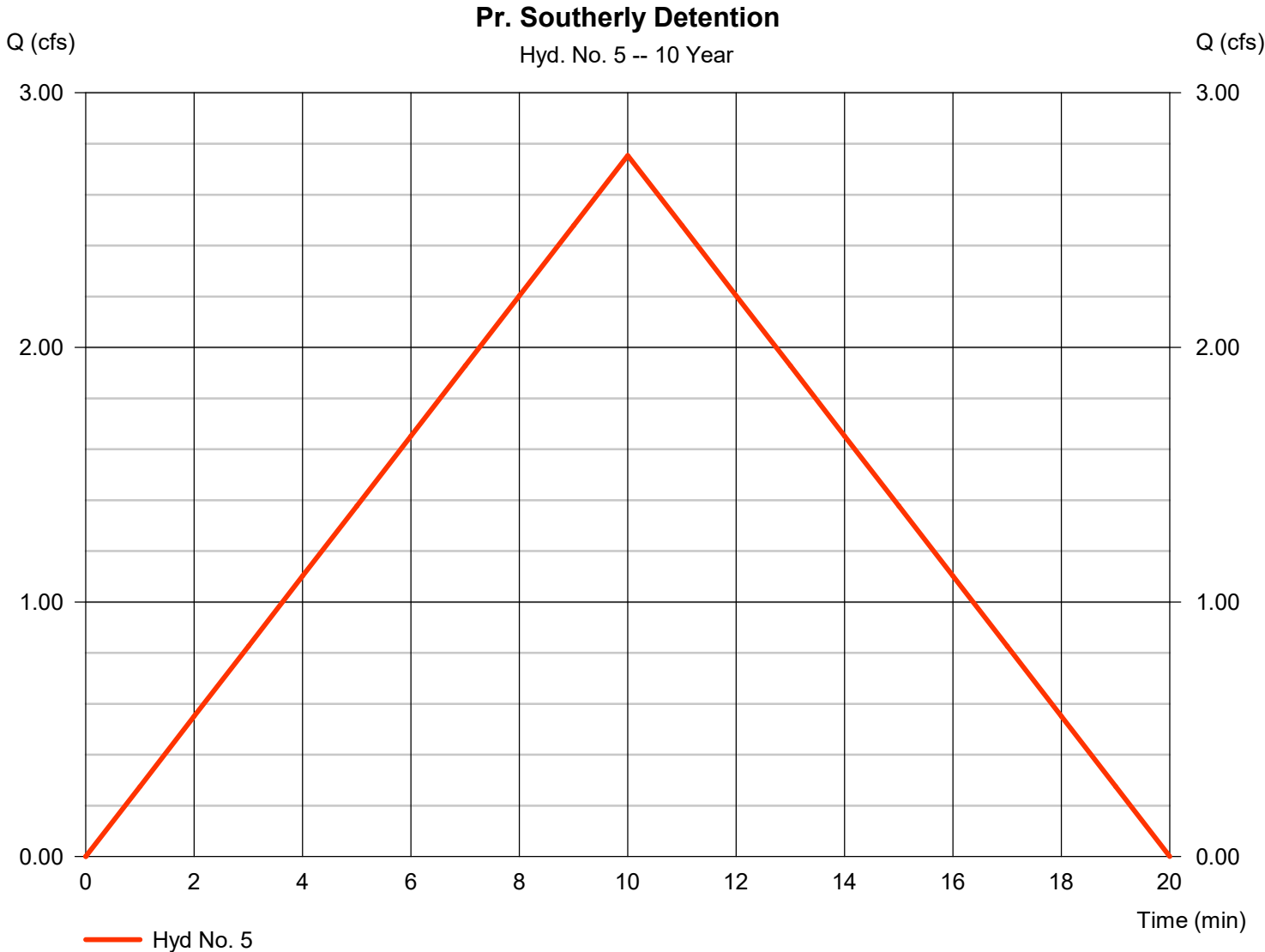


# Hydrograph Report

## Hyd. No. 5

Pr. Southerly Detention

|                 |                                  |                 |              |
|-----------------|----------------------------------|-----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 2.754 cfs  |
| Storm frequency | = 10 yrs                         | Time to peak    | = 10 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 1,652 cuft |
| Drainage area   | = 1.330 ac                       | Runoff coeff.   | = 0.43       |
| Intensity       | = 4.815 in/hr                    | Tc by User      | = 10.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1        |





# Hydrograph Report

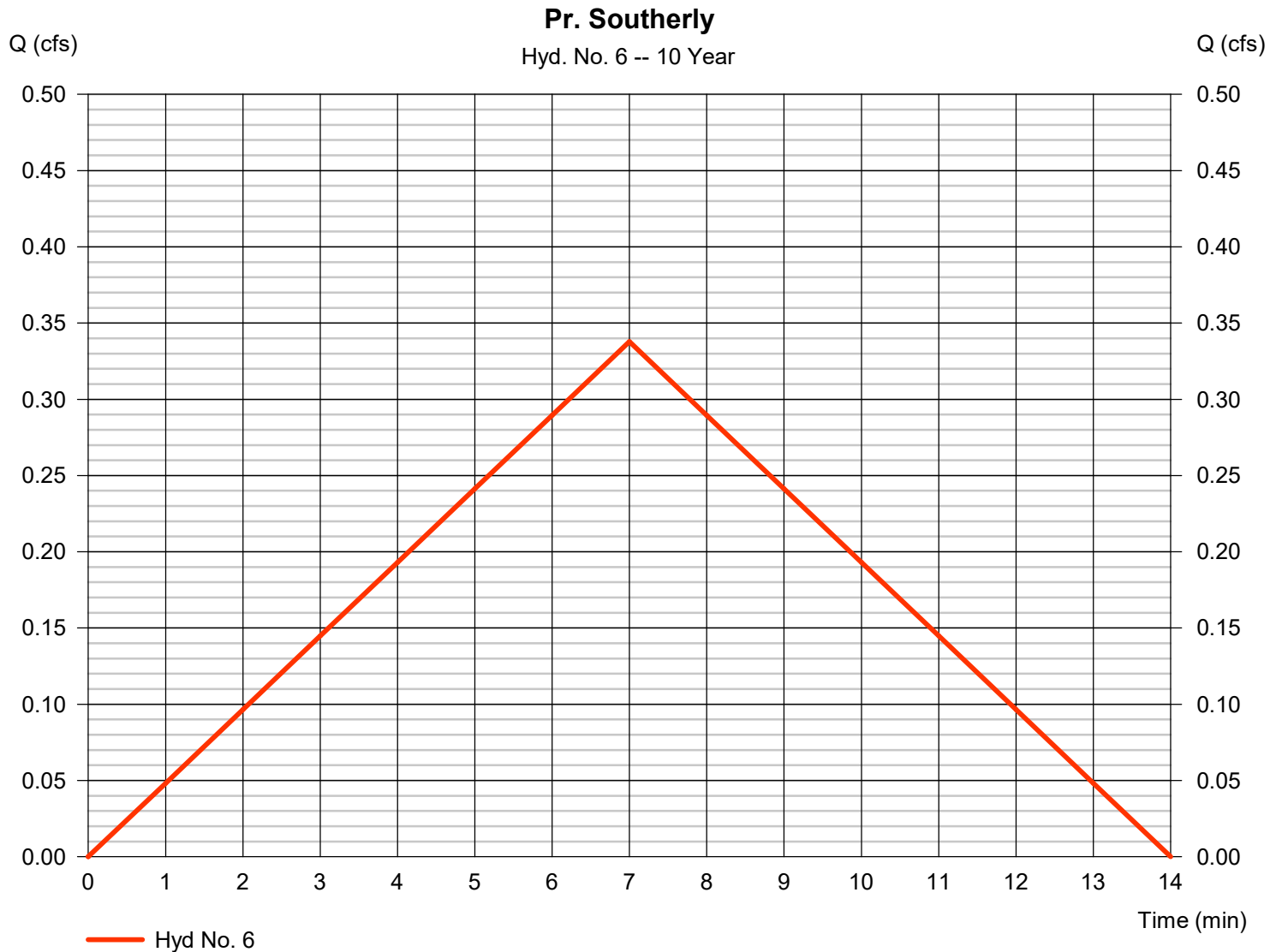
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 6

Pr. Southerly

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge | = 0.338 cfs |
| Storm frequency | = 10 yrs                         | Time to peak   | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume    | = 142 cuft  |
| Drainage area   | = 0.490 ac                       | Runoff coeff.  | = 0.12      |
| Intensity       | = 5.745 in/hr                    | Tc by User     | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Coef/IDF    | = 1/1       |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

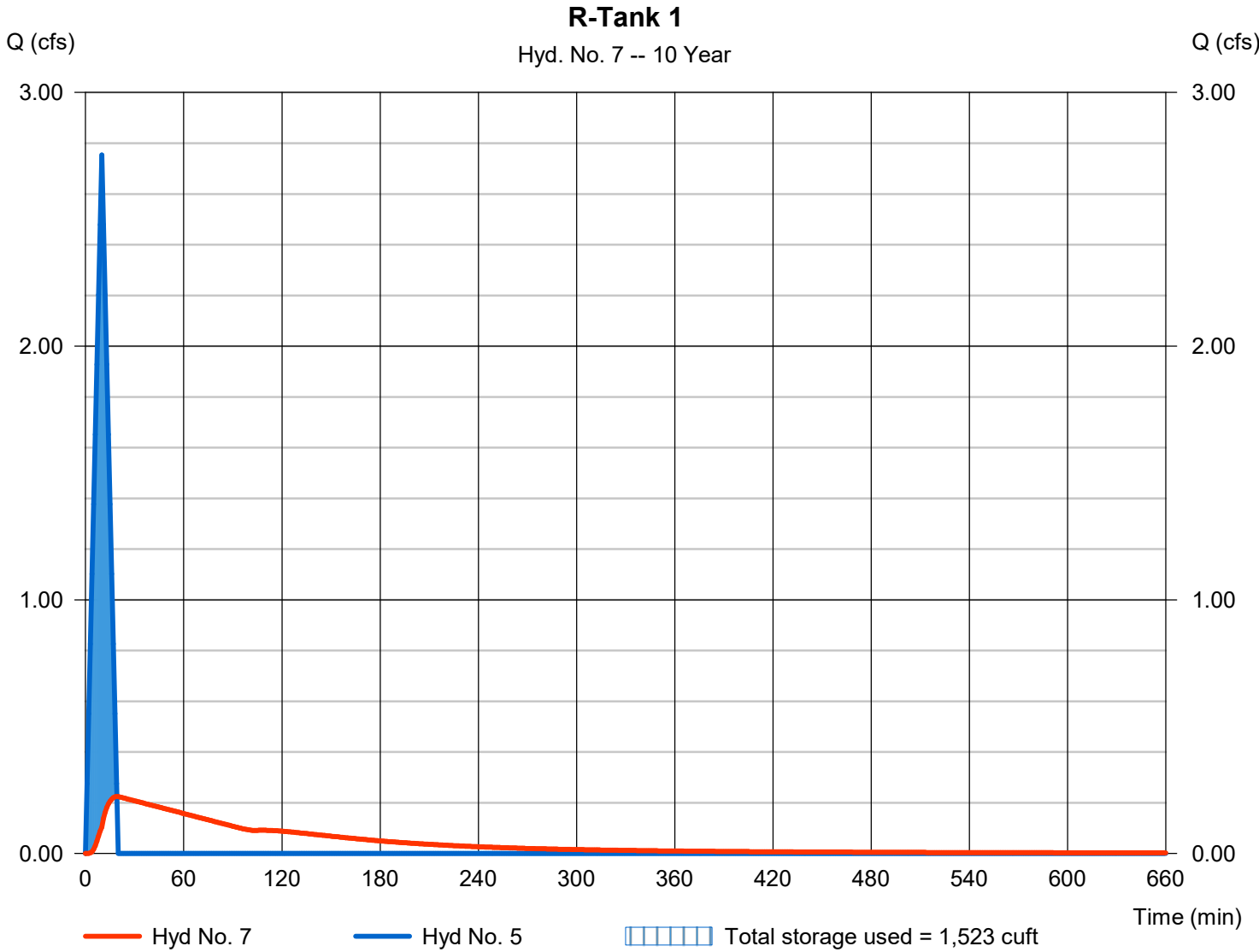
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## Hyd. No. 7

R-Tank 1

|                 |                                |                |              |
|-----------------|--------------------------------|----------------|--------------|
| Hydrograph type | = Reservoir                    | Peak discharge | = 0.225 cfs  |
| Storm frequency | = 10 yrs                       | Time to peak   | = 19 min     |
| Time interval   | = 1 min                        | Hyd. volume    | = 1,604 cuft |
| Inflow hyd. No. | = 5 - Pr. Southerly Detention  | Max. Elevation | = 673.17 ft  |
| Reservoir name  | = Southerly Watershed R-Tank 1 | Max. Storage   | = 1,523 cuft |

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 8

Pr. Easterly

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge | = 0.724 cfs |
| Storm frequency | = 10 yrs                         | Time to peak   | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume    | = 304 cuft  |
| Drainage area   | = 0.300 ac                       | Runoff coeff.  | = 0.42      |
| Intensity       | = 5.745 in/hr                    | Tc by User     | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Coef/IDF    | = 1/1       |



# Hydrograph Report

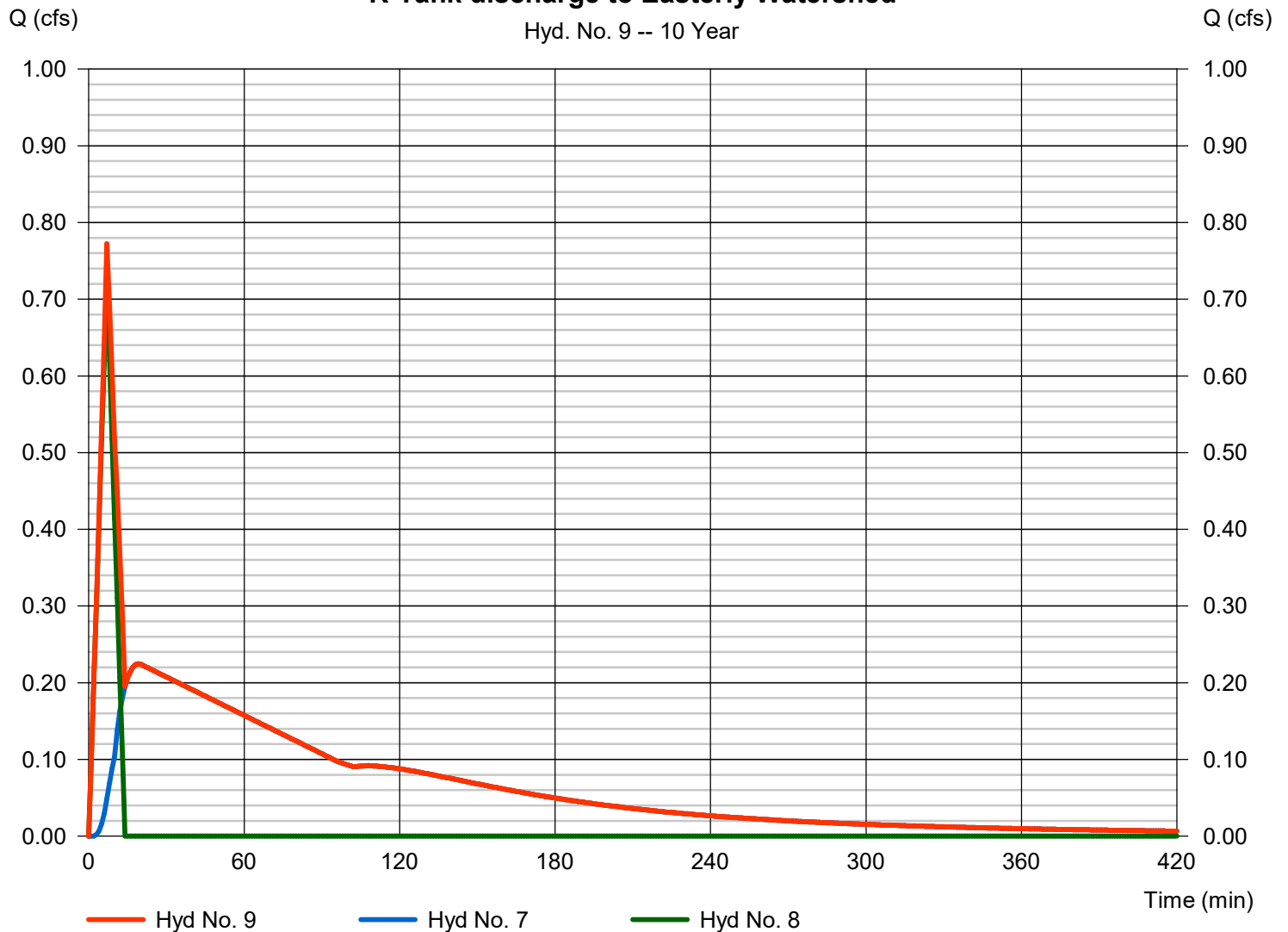
## Hyd. No. 9

R-Tank discharge to Easterly Watershed

|                 |           |                      |              |
|-----------------|-----------|----------------------|--------------|
| Hydrograph type | = Combine | Peak discharge       | = 0.772 cfs  |
| Storm frequency | = 10 yrs  | Time to peak         | = 7 min      |
| Time interval   | = 1 min   | Hyd. volume          | = 1,908 cuft |
| Inflow hyds.    | = 7, 8    | Contrib. drain. area | = 0.300 ac   |

### R-Tank discharge to Easterly Watershed

Hyd. No. 9 -- 10 Year



# Hydrograph Report

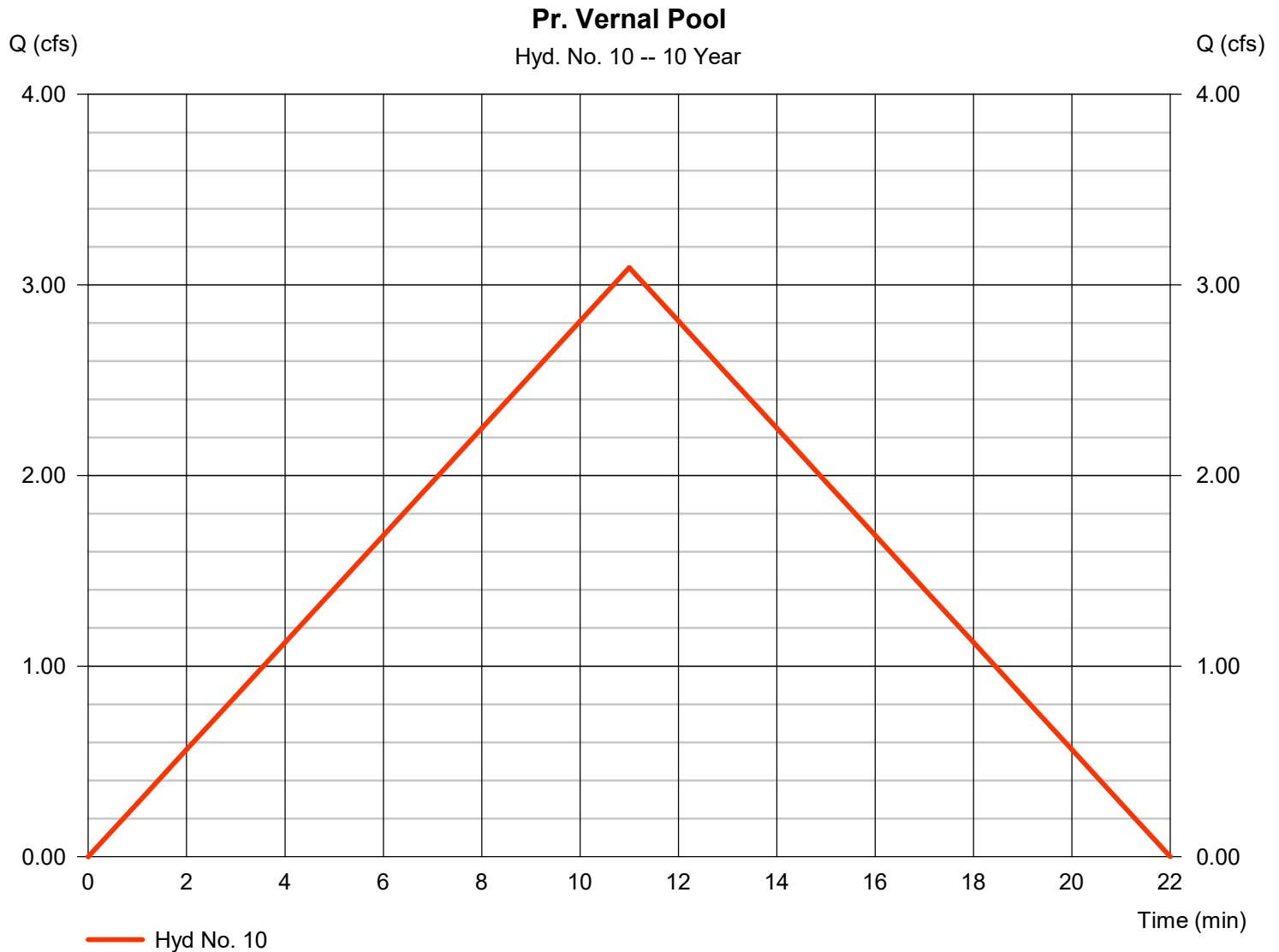
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 10

Pr. Vernal Pool

|                 |                                  |                 |              |
|-----------------|----------------------------------|-----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 3.091 cfs  |
| Storm frequency | = 10 yrs                         | Time to peak    | = 11 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 2,040 cuft |
| Drainage area   | = 3.750 ac                       | Runoff coeff.   | = 0.18       |
| Intensity       | = 4.580 in/hr                    | Tc by User      | = 11.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1        |



# Hydrograph Report

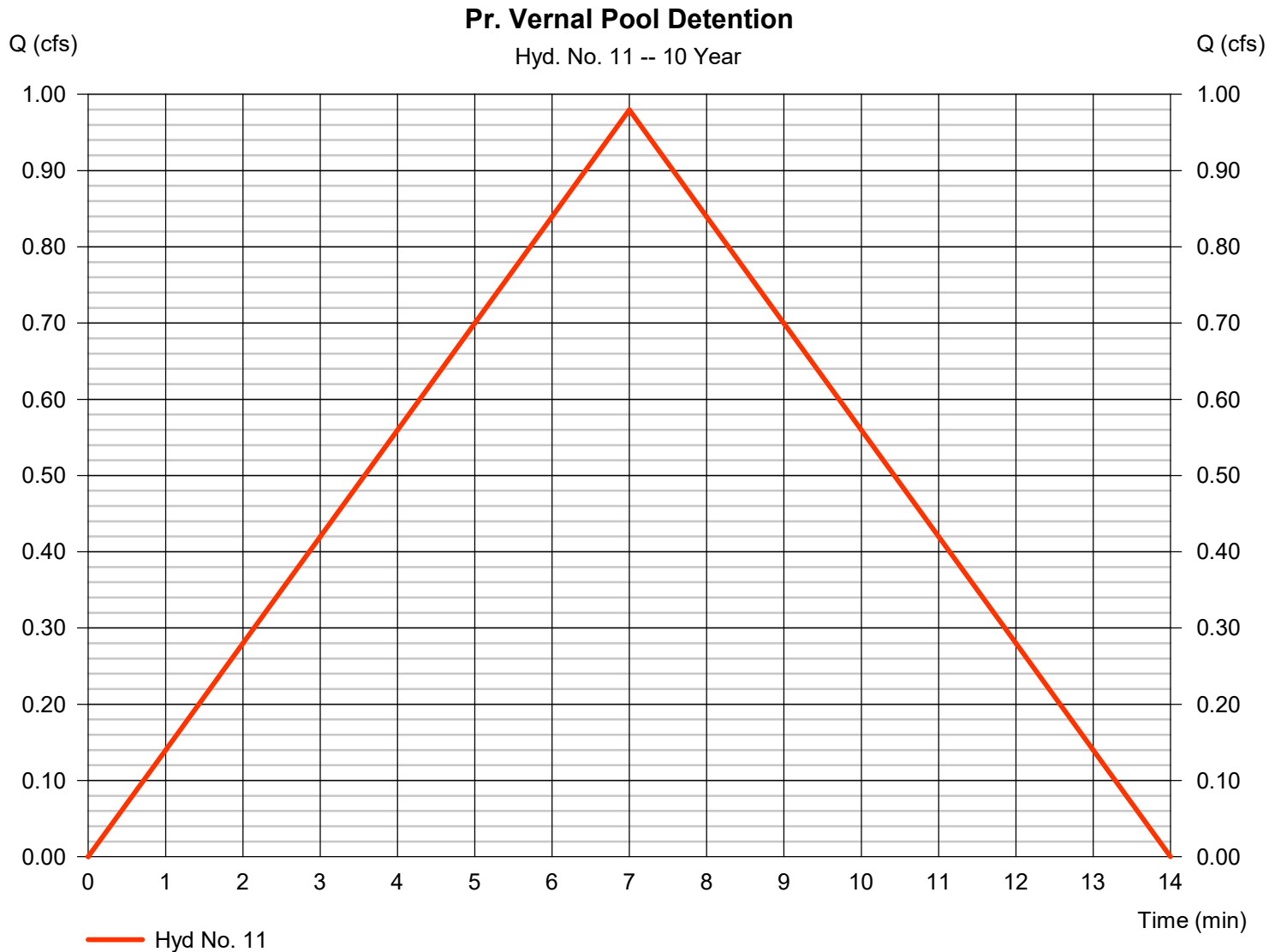
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 11

Pr. Vernal Pool Detention

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 0.980 cfs |
| Storm frequency | = 10 yrs                         | Time to peak    | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 411 cuft  |
| Drainage area   | = 0.550 ac                       | Runoff coeff.   | = 0.31      |
| Intensity       | = 5.745 in/hr                    | Tc by User      | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

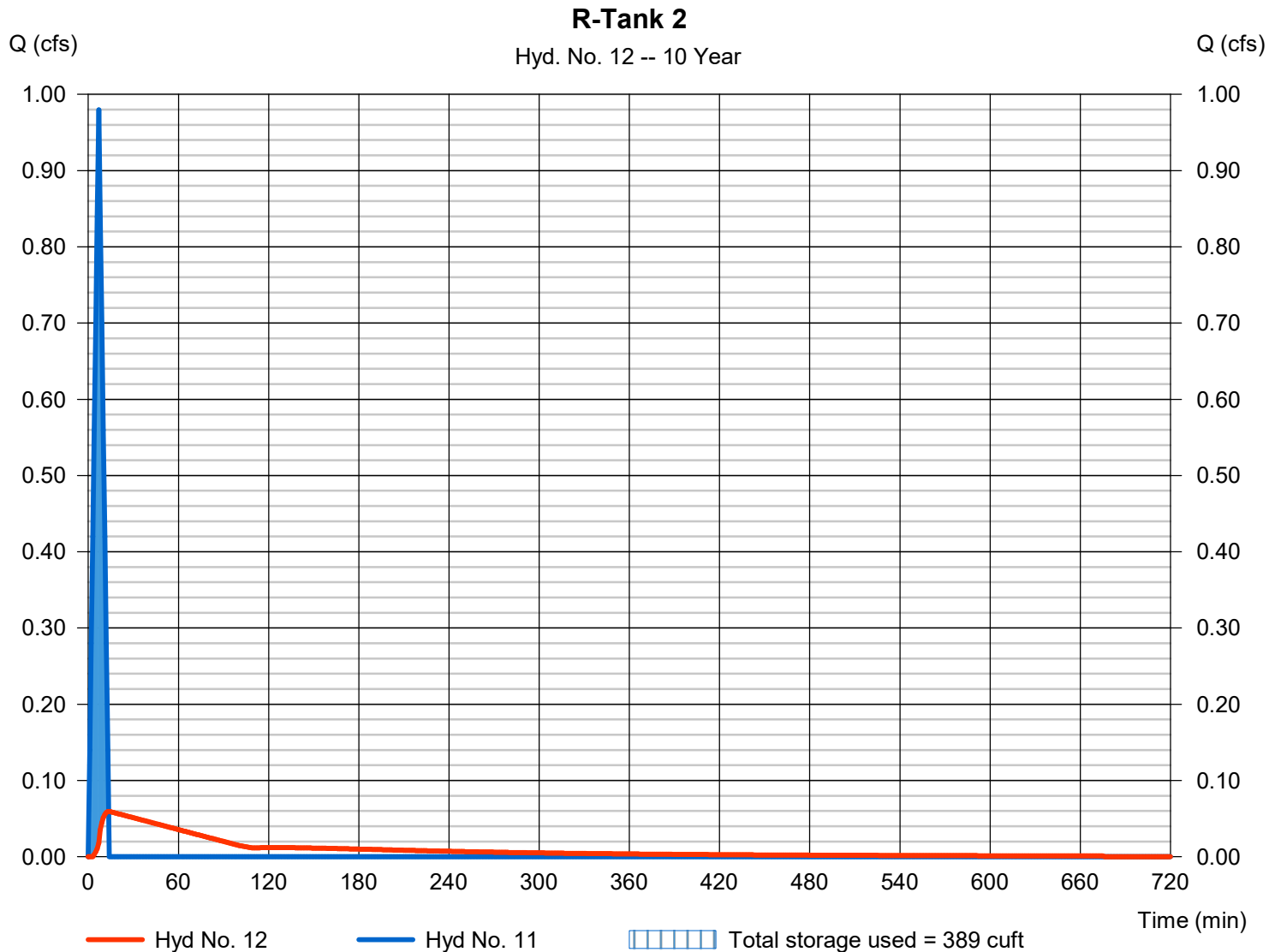
Monday, 11 / 20 / 2023

## Hyd. No. 12

R-Tank 2

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Reservoir                      | Peak discharge | = 0.059 cfs |
| Storm frequency | = 10 yrs                         | Time to peak   | = 14 min    |
| Time interval   | = 1 min                          | Hyd. volume    | = 373 cuft  |
| Inflow hyd. No. | = 11 - Pr. Vernal Pool Detention | Max. Elevation | = 672.18 ft |
| Reservoir name  | = Vernal Pool Watershed R-Tank   | Max. Storage   | = 389 cuft  |

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 13

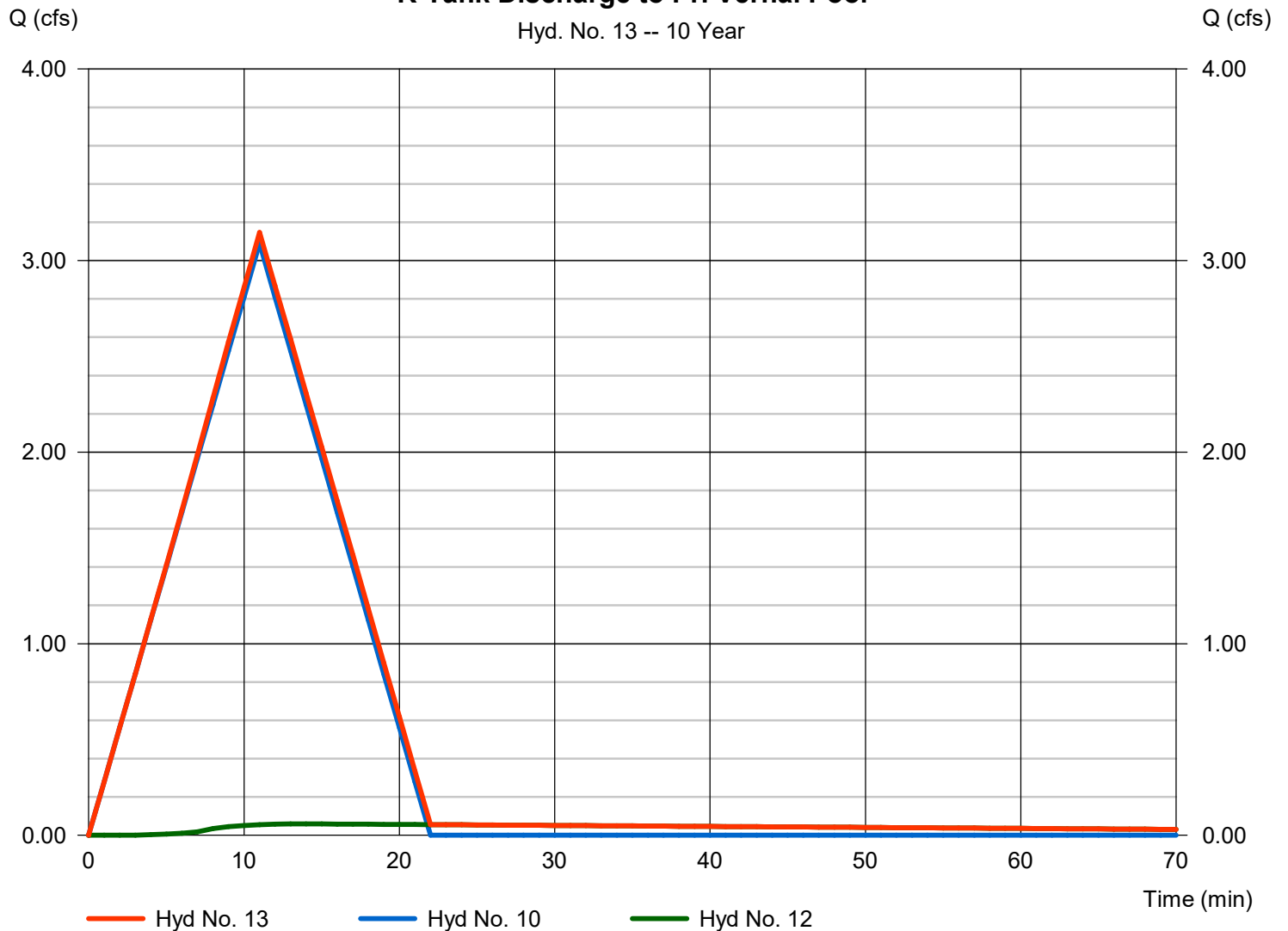
R-Tank Discharge to Pr. Vernal Pool

Hydrograph type = Combine  
Storm frequency = 10 yrs  
Time interval = 1 min  
Inflow hyds. = 10, 12

Peak discharge = 3.147 cfs  
Time to peak = 11 min  
Hyd. volume = 2,413 cuft  
Contrib. drain. area = 3.750 ac

### R-Tank Discharge to Pr. Vernal Pool

Hyd. No. 13 -- 10 Year





# Hydrograph Report

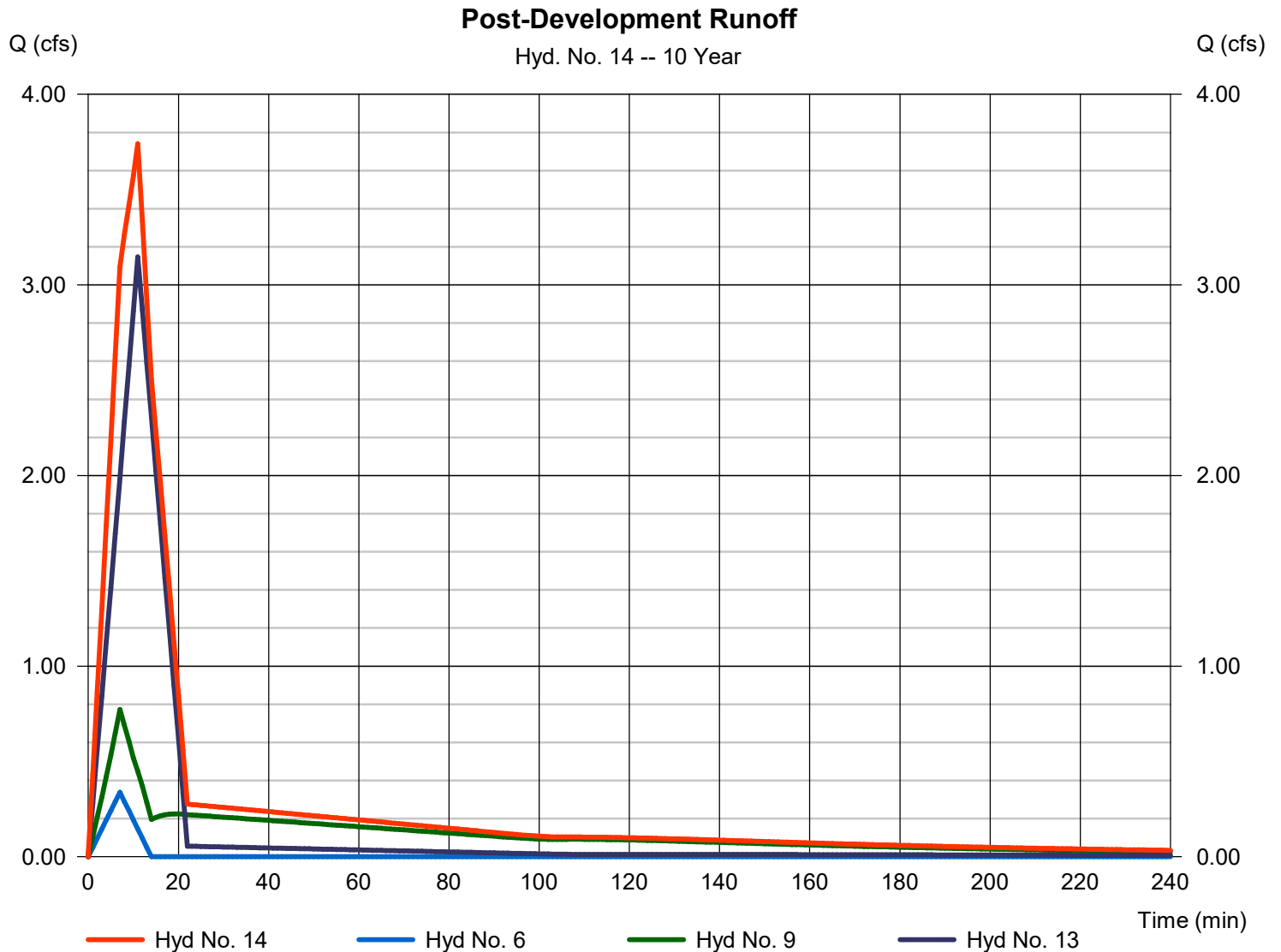
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 14

### Post-Development Runoff

|                 |            |                      |              |
|-----------------|------------|----------------------|--------------|
| Hydrograph type | = Combine  | Peak discharge       | = 3.740 cfs  |
| Storm frequency | = 10 yrs   | Time to peak         | = 11 min     |
| Time interval   | = 1 min    | Hyd. volume          | = 4,464 cuft |
| Inflow hyds.    | = 6, 9, 13 | Contrib. drain. area | = 0.490 ac   |



# Hydrograph Report

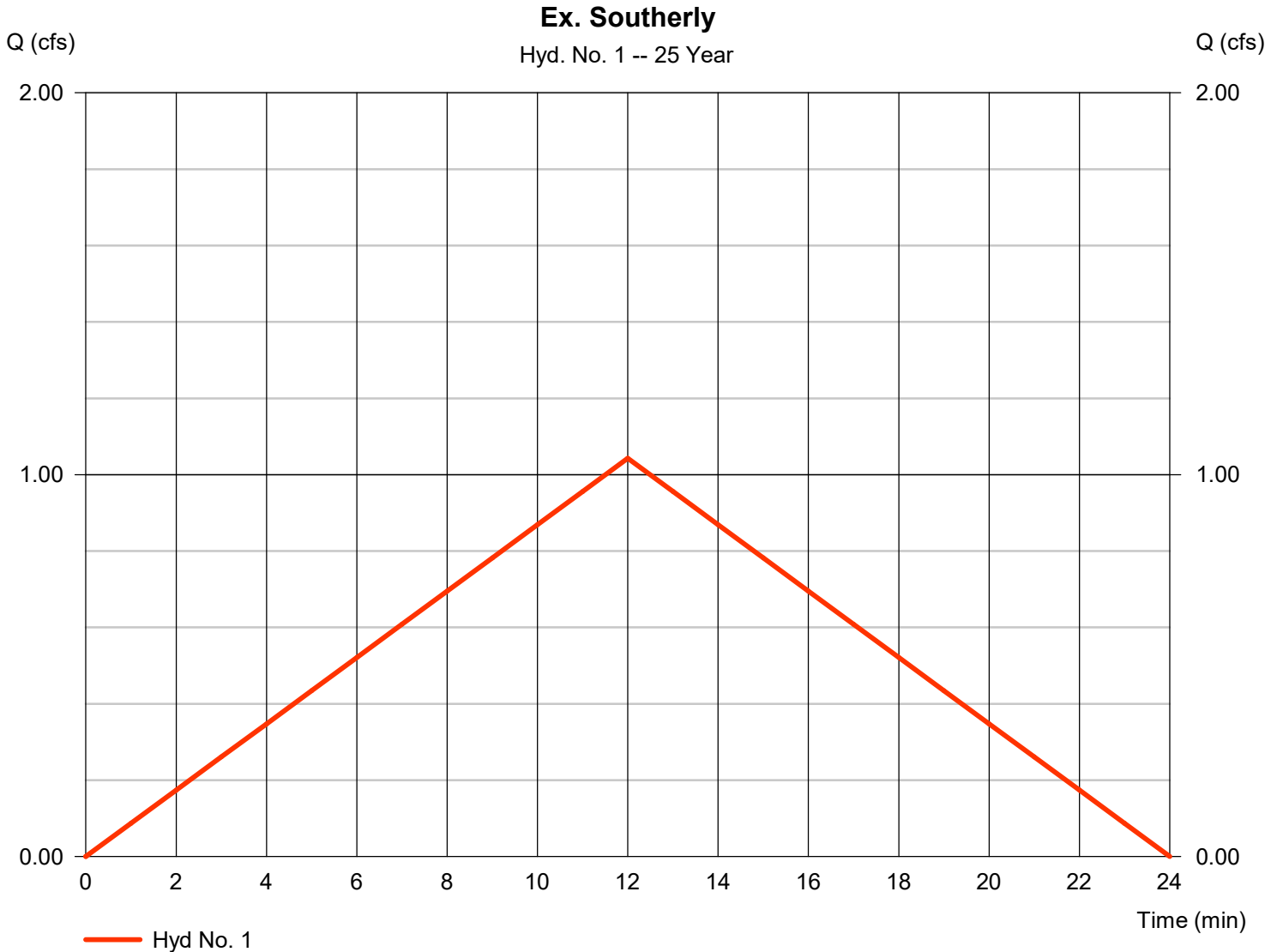
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 1

Ex. Southerly

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 1.043 cfs |
| Storm frequency | = 25 yrs                         | Time to peak    | = 12 min    |
| Time interval   | = 1 min                          | Hyd. volume     | = 751 cuft  |
| Drainage area   | = 1.950 ac                       | Runoff coeff.   | = 0.1       |
| Intensity       | = 5.348 in/hr                    | Tc by User      | = 12.00 min |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |



# Hydrograph Report

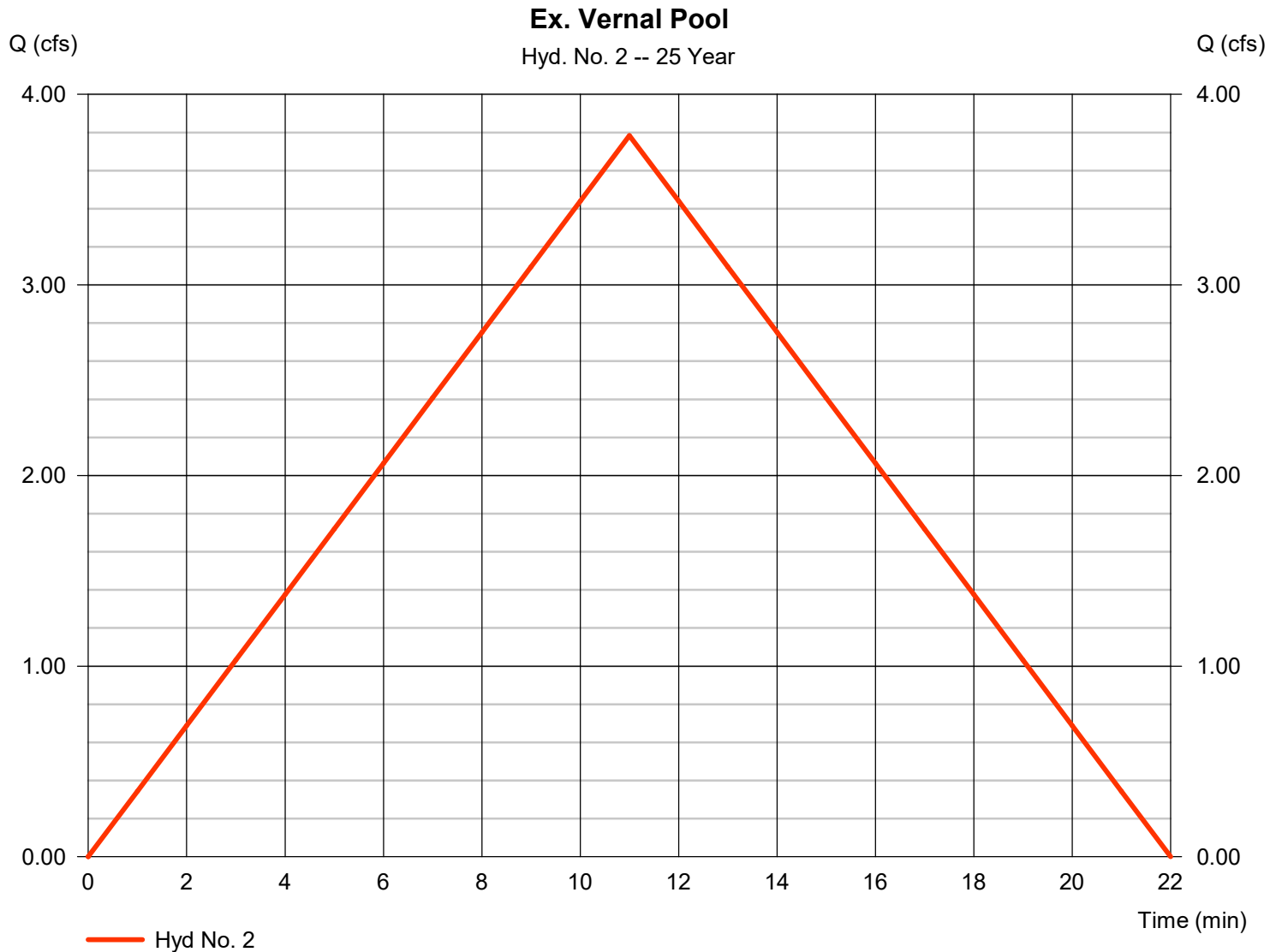
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 2

Ex. Vernal Pool

|                 |                                  |                 |              |
|-----------------|----------------------------------|-----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 3.784 cfs  |
| Storm frequency | = 25 yrs                         | Time to peak    | = 11 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 2,497 cuft |
| Drainage area   | = 4.220 ac                       | Runoff coeff.   | = 0.16       |
| Intensity       | = 5.604 in/hr                    | Tc by User      | = 11.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1        |

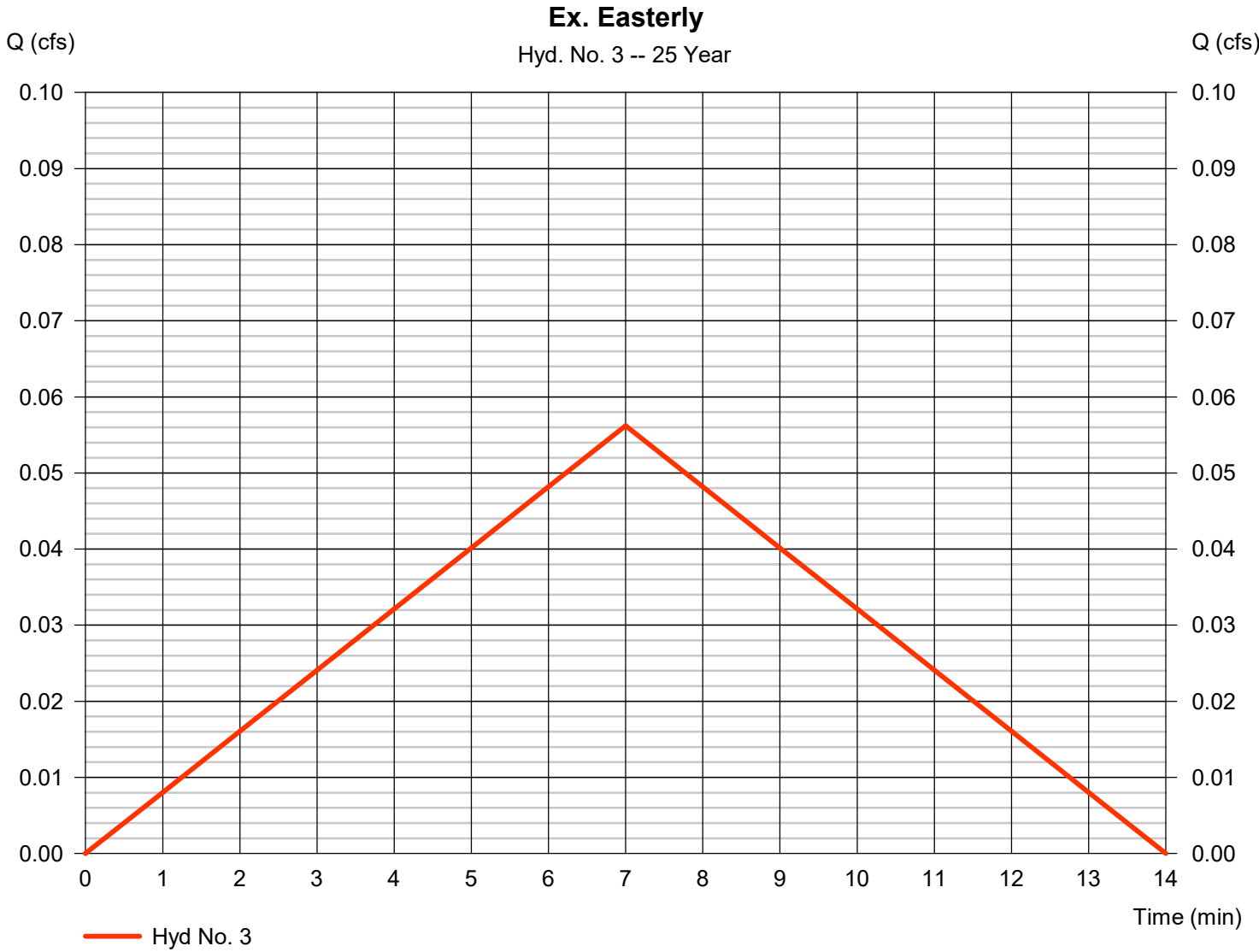


# Hydrograph Report

## Hyd. No. 3

Ex. Easterly

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge | = 0.056 cfs |
| Storm frequency | = 25 yrs                         | Time to peak   | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume    | = 24 cuft   |
| Drainage area   | = 0.080 ac                       | Runoff coeff.  | = 0.1       |
| Intensity       | = 7.028 in/hr                    | Tc by User     | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Coef/Dfact  | = 1/1       |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

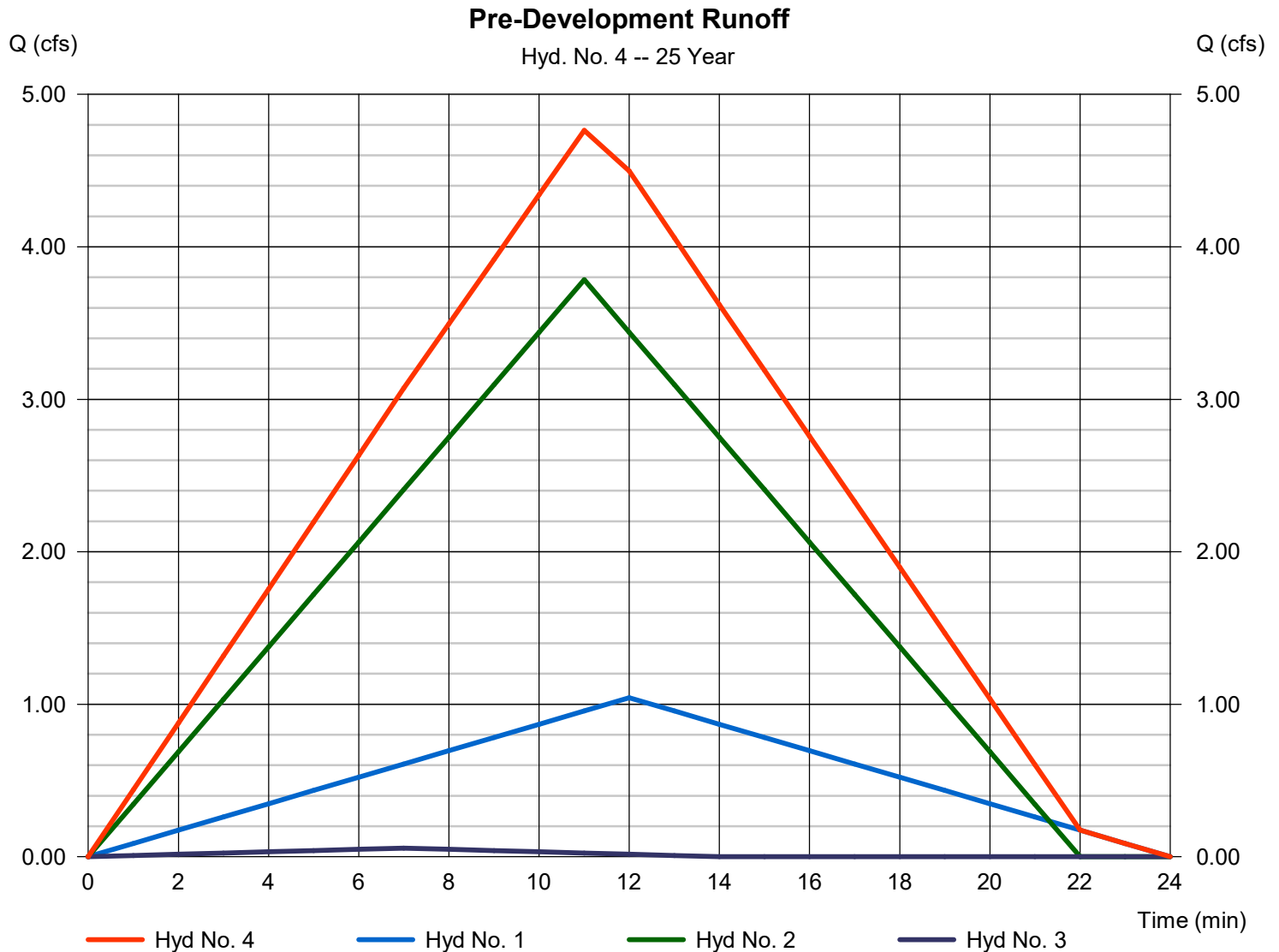
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## Hyd. No. 4

### Pre-Development Runoff

Hydrograph type = Combine  
Storm frequency = 25 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2, 3

Peak discharge = 4.764 cfs  
Time to peak = 11 min  
Hyd. volume = 3,272 cuft  
Contrib. drain. area = 6.250 ac



# Hydrograph Report

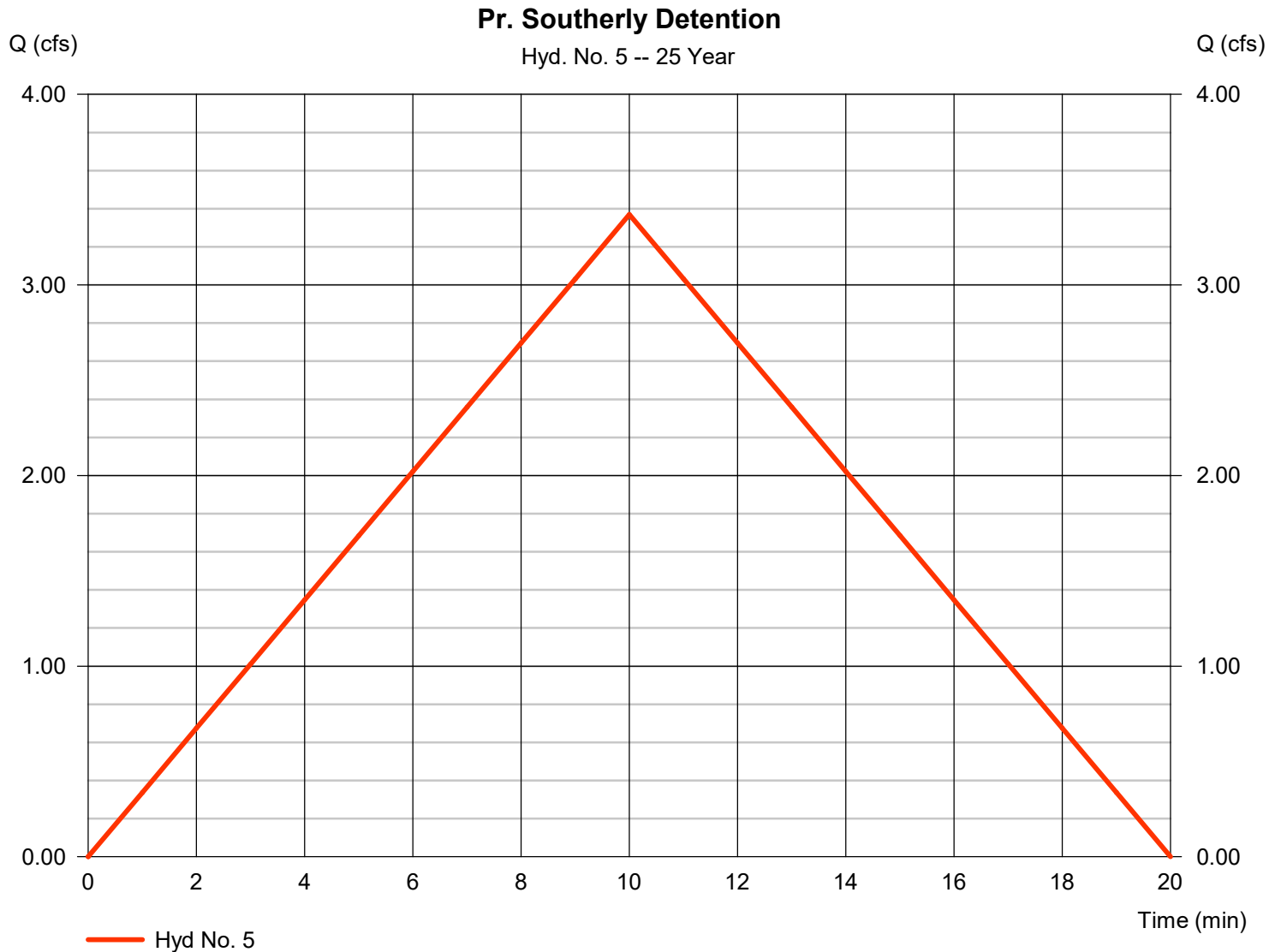
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 5

Pr. Southerly Detention

|                 |                                  |                 |              |
|-----------------|----------------------------------|-----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 3.369 cfs  |
| Storm frequency | = 25 yrs                         | Time to peak    | = 10 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 2,022 cuft |
| Drainage area   | = 1.330 ac                       | Runoff coeff.   | = 0.43       |
| Intensity       | = 5.891 in/hr                    | Tc by User      | = 10.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1        |



# Hydrograph Report

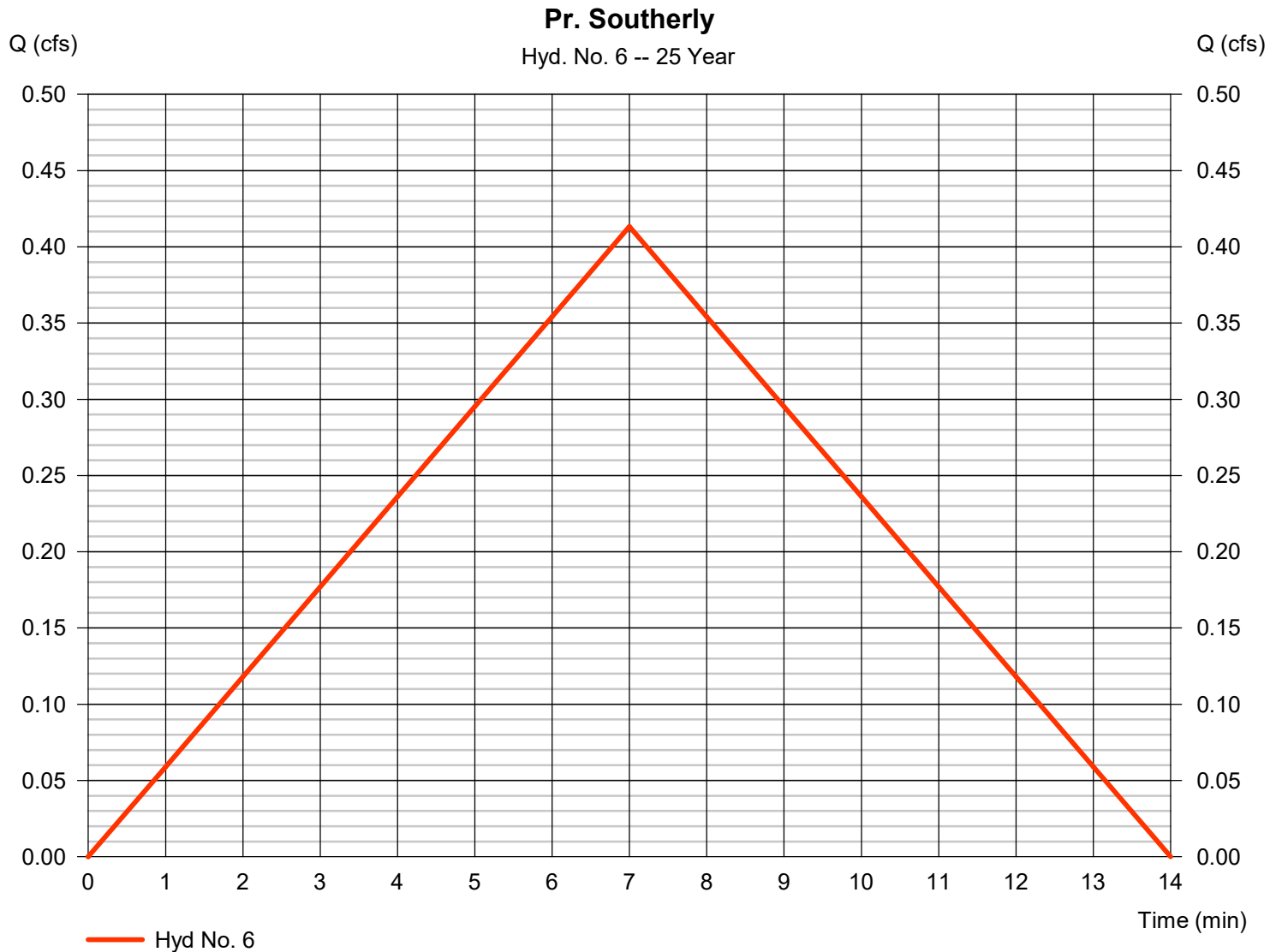
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 6

Pr. Southerly

|                 |                                  |                  |             |
|-----------------|----------------------------------|------------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge   | = 0.413 cfs |
| Storm frequency | = 25 yrs                         | Time to peak     | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume      | = 174 cuft  |
| Drainage area   | = 0.490 ac                       | Runoff coeff.    | = 0.12      |
| Intensity       | = 7.028 in/hr                    | Tc by User       | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Coef/IDF fact | = 1/1       |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

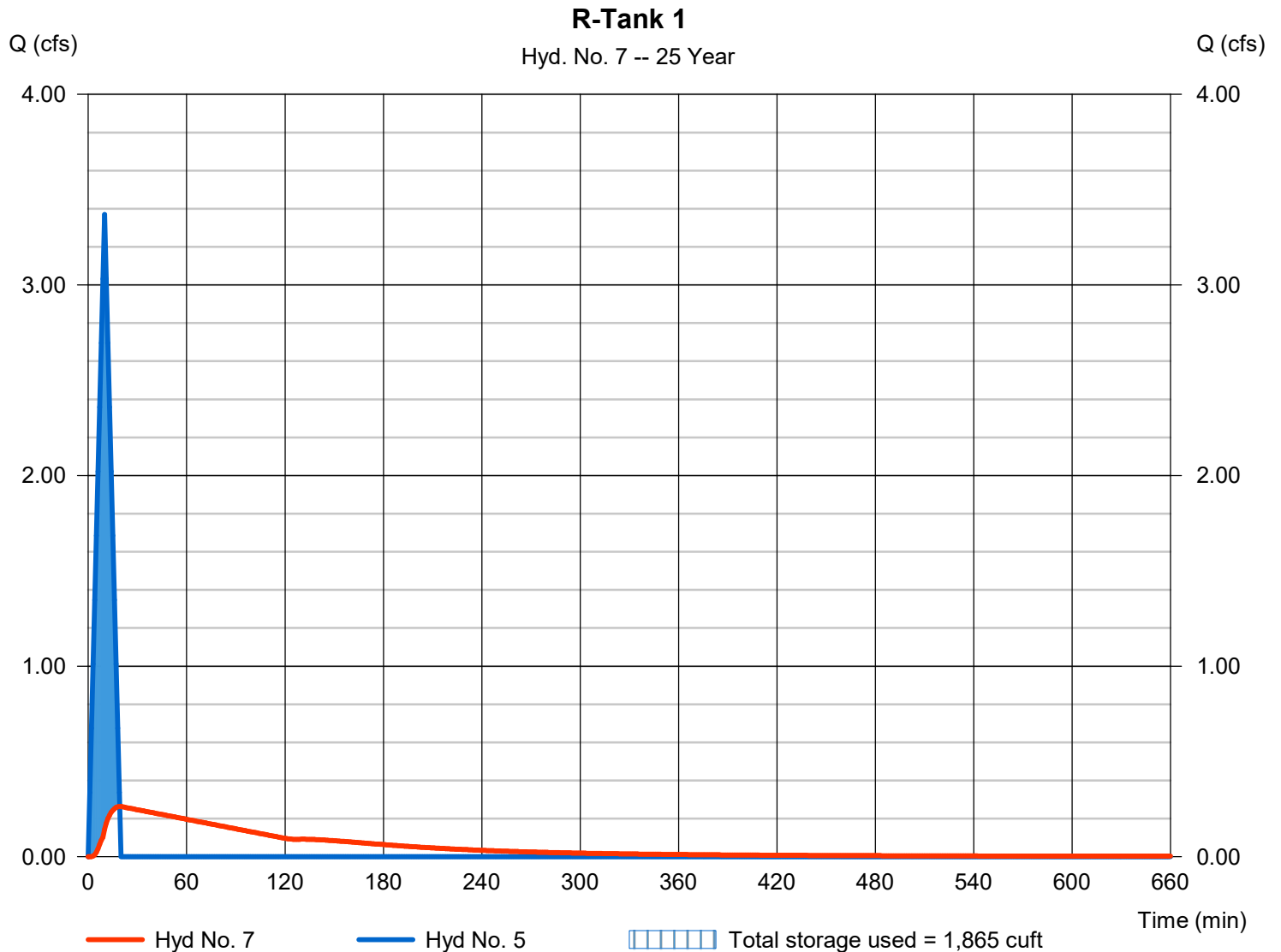
Monday, 11 / 20 / 2023

## Hyd. No. 7

R-Tank 1

|                 |                                |                |              |
|-----------------|--------------------------------|----------------|--------------|
| Hydrograph type | = Reservoir                    | Peak discharge | = 0.264 cfs  |
| Storm frequency | = 25 yrs                       | Time to peak   | = 19 min     |
| Time interval   | = 1 min                        | Hyd. volume    | = 1,974 cuft |
| Inflow hyd. No. | = 5 - Pr. Southerly Detention  | Max. Elevation | = 673.32 ft  |
| Reservoir name  | = Southerly Watershed R-Tank 1 | Max. Storage   | = 1,865 cuft |

Storage Indication method used.





# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 8

Pr. Easterly

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge | = 0.886 cfs |
| Storm frequency | = 25 yrs                         | Time to peak   | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume    | = 372 cuft  |
| Drainage area   | = 0.300 ac                       | Runoff coeff.  | = 0.42      |
| Intensity       | = 7.028 in/hr                    | Tc by User     | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Coef/IDF    | = 1/1       |



# Hydrograph Report

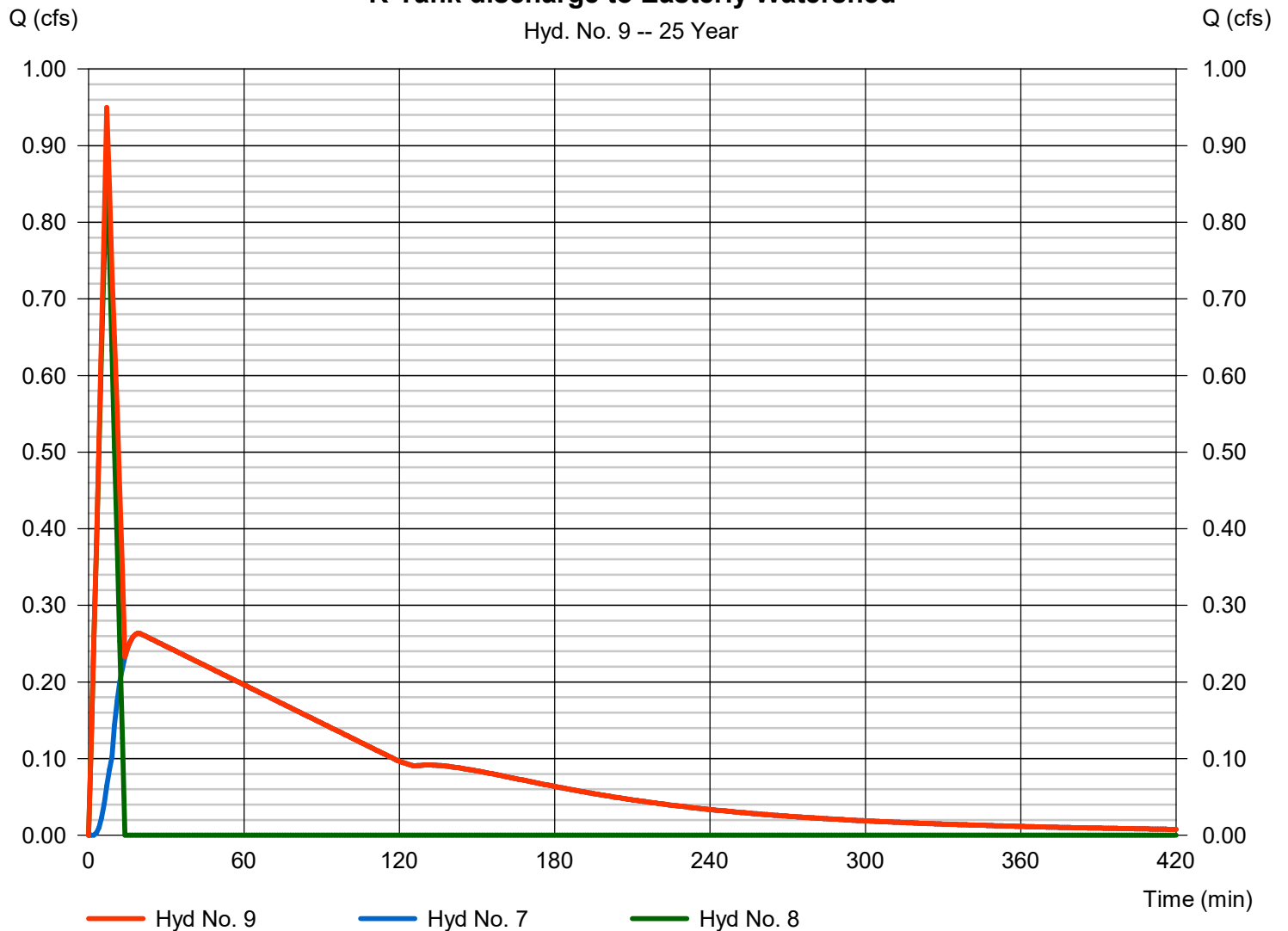
## Hyd. No. 9

R-Tank discharge to Easterly Watershed

|                 |           |                      |              |
|-----------------|-----------|----------------------|--------------|
| Hydrograph type | = Combine | Peak discharge       | = 0.950 cfs  |
| Storm frequency | = 25 yrs  | Time to peak         | = 7 min      |
| Time interval   | = 1 min   | Hyd. volume          | = 2,345 cuft |
| Inflow hyds.    | = 7, 8    | Contrib. drain. area | = 0.300 ac   |

### R-Tank discharge to Easterly Watershed

Hyd. No. 9 -- 25 Year



# Hydrograph Report

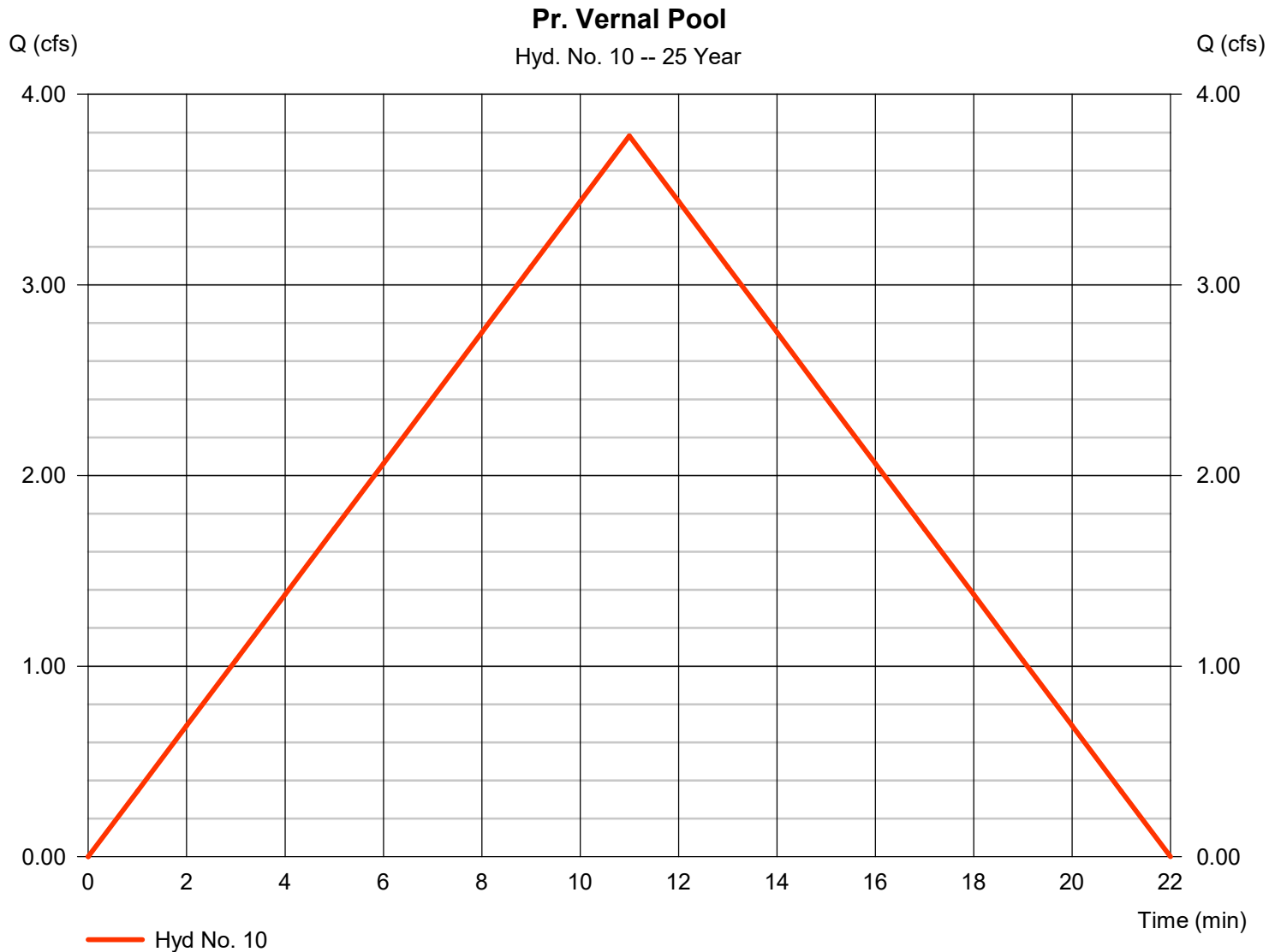
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Monday, 11 / 20 / 2023

## Hyd. No. 10

Pr. Vernal Pool

|                 |                                  |                 |              |
|-----------------|----------------------------------|-----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 3.782 cfs  |
| Storm frequency | = 25 yrs                         | Time to peak    | = 11 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 2,496 cuft |
| Drainage area   | = 3.750 ac                       | Runoff coeff.   | = 0.18       |
| Intensity       | = 5.604 in/hr                    | Tc by User      | = 11.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1        |



# Hydrograph Report

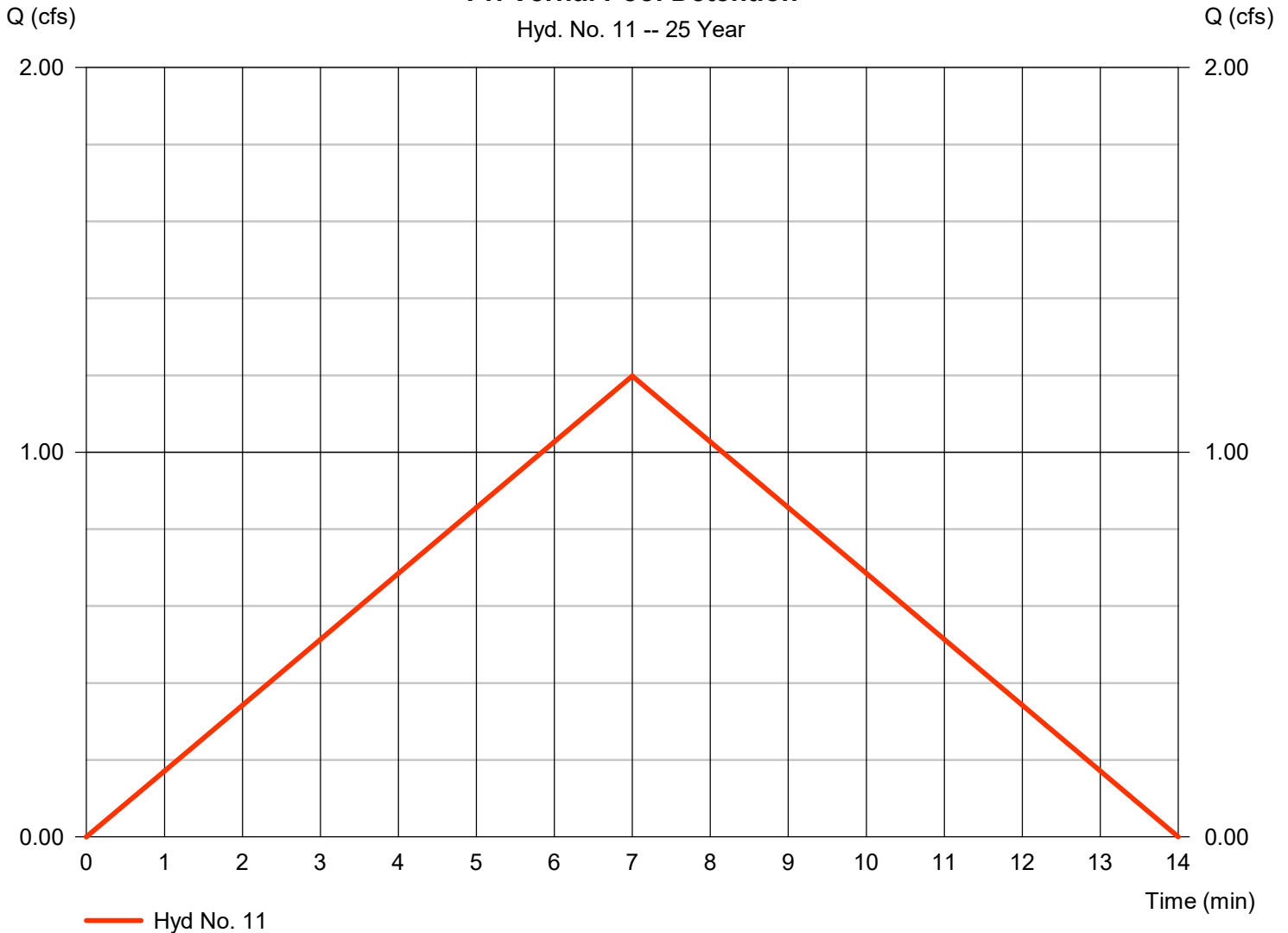
## Hyd. No. 11

Pr. Vernal Pool Detention

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 1.198 cfs |
| Storm frequency | = 25 yrs                         | Time to peak    | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 503 cuft  |
| Drainage area   | = 0.550 ac                       | Runoff coeff.   | = 0.31      |
| Intensity       | = 7.028 in/hr                    | Tc by User      | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |

**Pr. Vernal Pool Detention**

Hyd. No. 11 -- 25 Year



# Hydrograph Report

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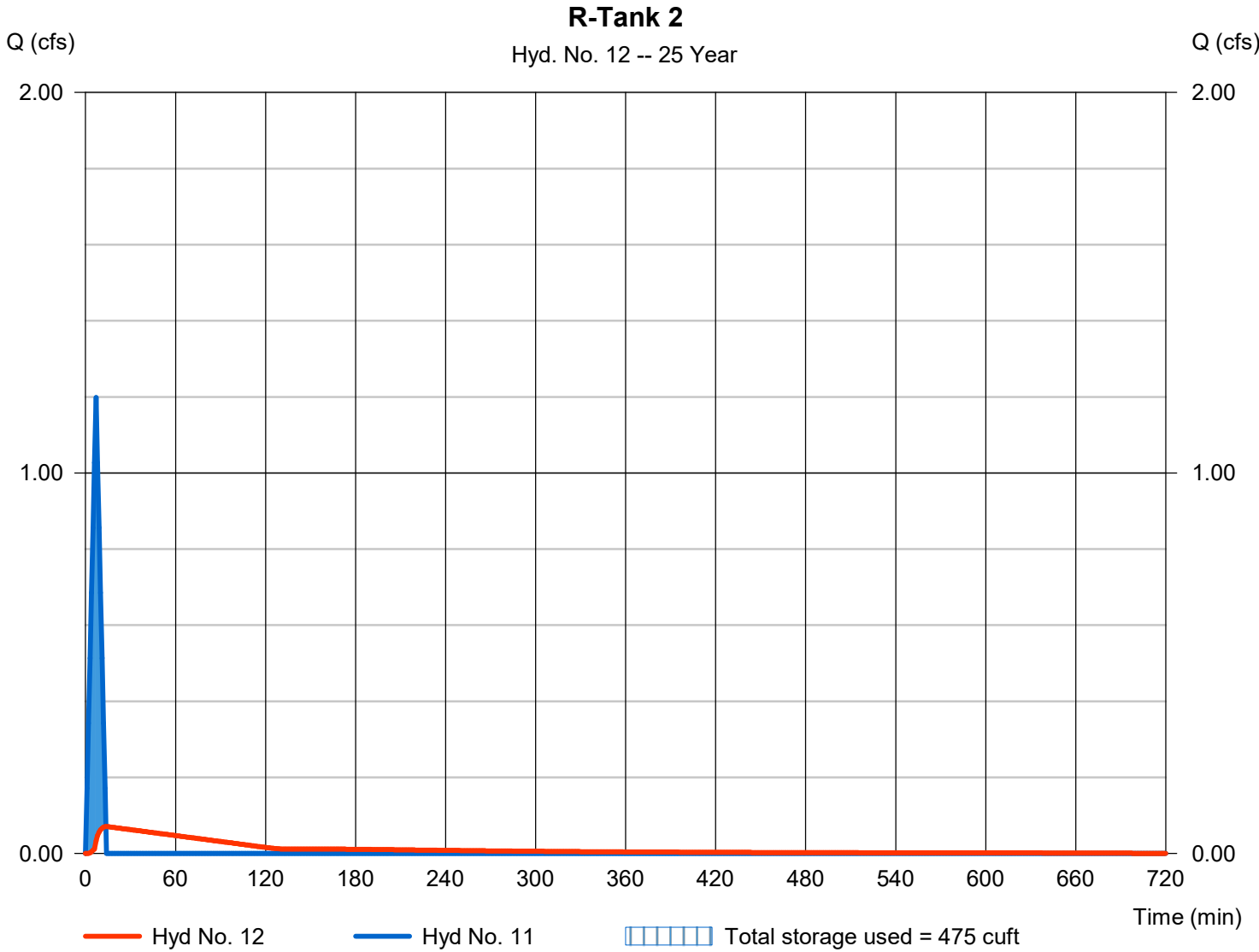
Monday, 11 / 20 / 2023

## Hyd. No. 12

R-Tank 2

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Reservoir                      | Peak discharge | = 0.071 cfs |
| Storm frequency | = 25 yrs                         | Time to peak   | = 14 min    |
| Time interval   | = 1 min                          | Hyd. volume    | = 465 cuft  |
| Inflow hyd. No. | = 11 - Pr. Vernal Pool Detention | Max. Elevation | = 672.33 ft |
| Reservoir name  | = Vernal Pool Watershed R-Tank   | Max. Storage   | = 475 cuft  |

Storage Indication method used.



# Hydrograph Report

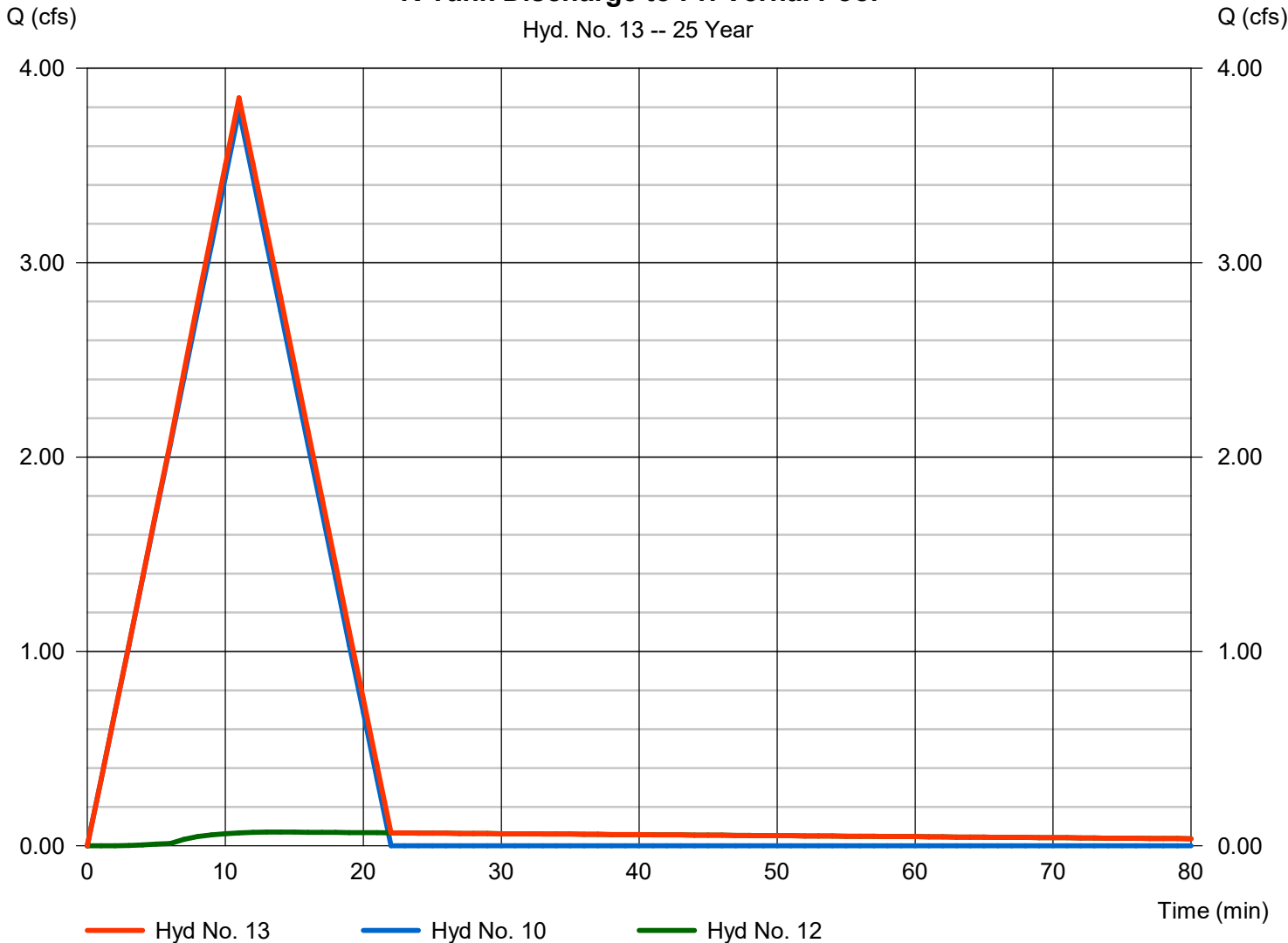
## Hyd. No. 13

R-Tank Discharge to Pr. Vernal Pool

|                 |           |                      |              |
|-----------------|-----------|----------------------|--------------|
| Hydrograph type | = Combine | Peak discharge       | = 3.849 cfs  |
| Storm frequency | = 25 yrs  | Time to peak         | = 11 min     |
| Time interval   | = 1 min   | Hyd. volume          | = 2,961 cuft |
| Inflow hyds.    | = 10, 12  | Contrib. drain. area | = 3.750 ac   |

### R-Tank Discharge to Pr. Vernal Pool

Hyd. No. 13 -- 25 Year



# Hydrograph Report

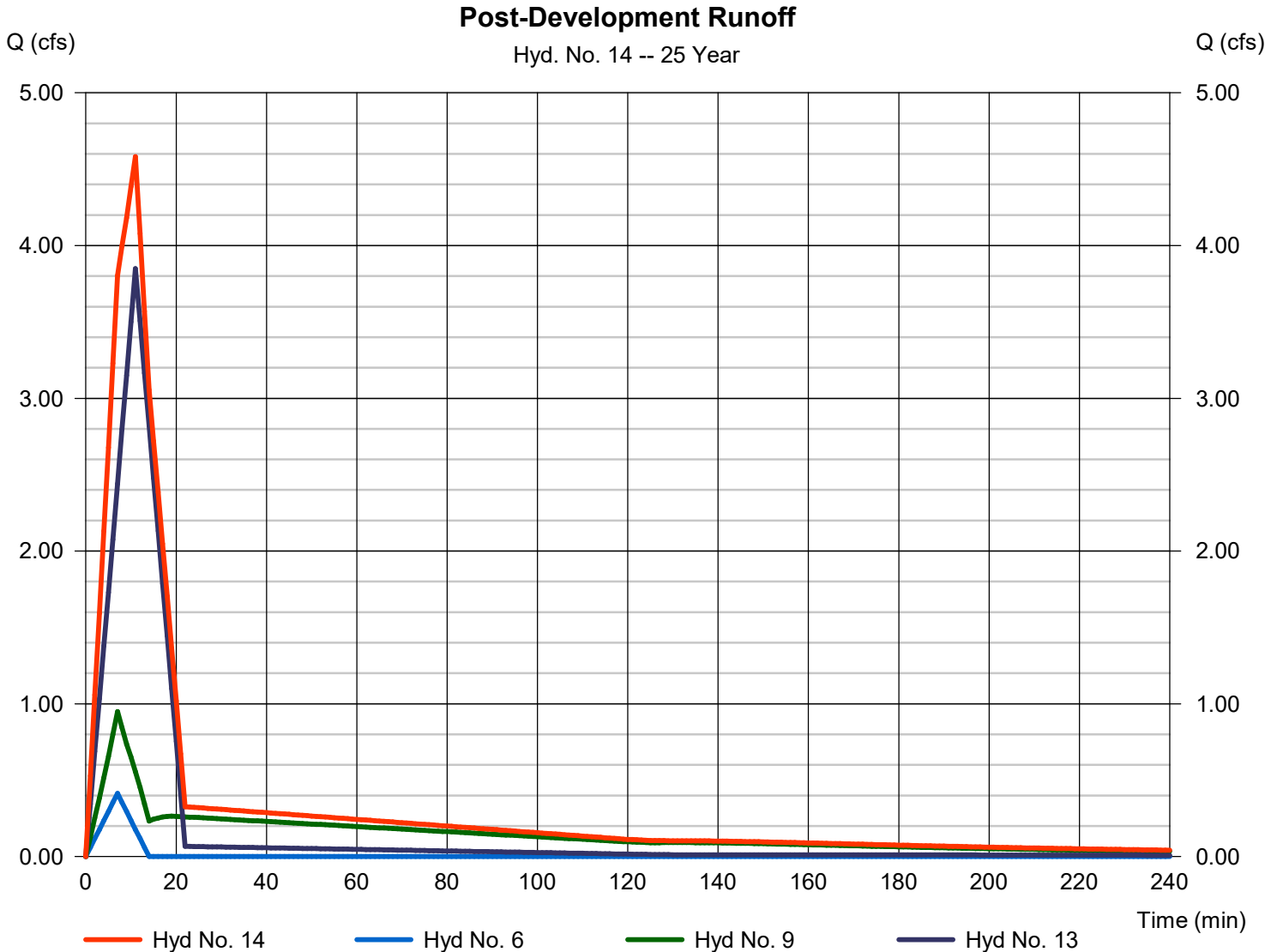
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## Hyd. No. 14

### Post-Development Runoff

|                 |            |                      |              |
|-----------------|------------|----------------------|--------------|
| Hydrograph type | = Combine  | Peak discharge       | = 4.581 cfs  |
| Storm frequency | = 25 yrs   | Time to peak         | = 11 min     |
| Time interval   | = 1 min    | Hyd. volume          | = 5,480 cuft |
| Inflow hyds.    | = 6, 9, 13 | Contrib. drain. area | = 0.490 ac   |

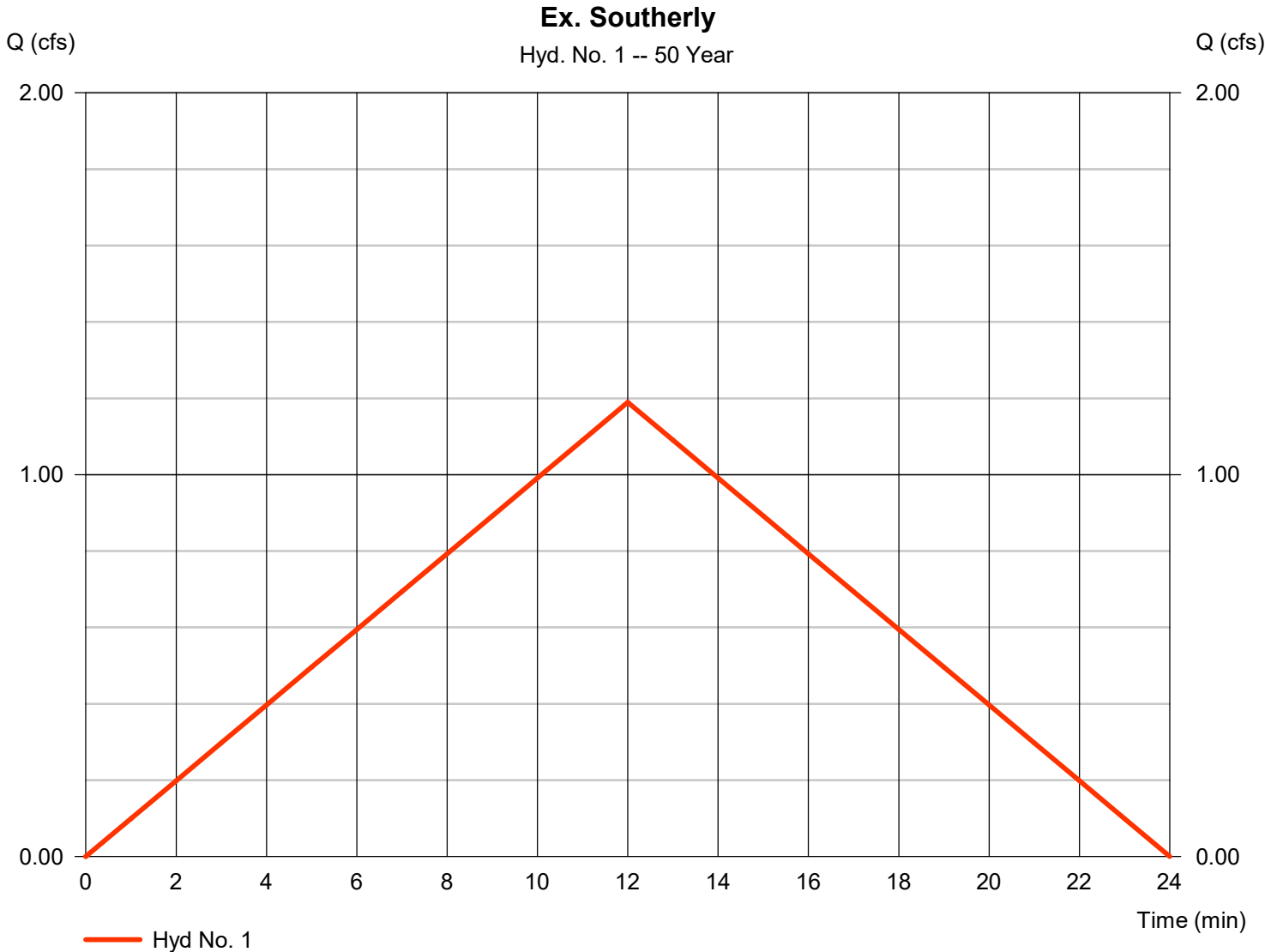


# Hydrograph Report

## Hyd. No. 1

Ex. Southerly

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 1.190 cfs |
| Storm frequency | = 50 yrs                         | Time to peak    | = 12 min    |
| Time interval   | = 1 min                          | Hyd. volume     | = 857 cuft  |
| Drainage area   | = 1.950 ac                       | Runoff coeff.   | = 0.1       |
| Intensity       | = 6.101 in/hr                    | Tc by User      | = 12.00 min |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |





# Hydrograph Report

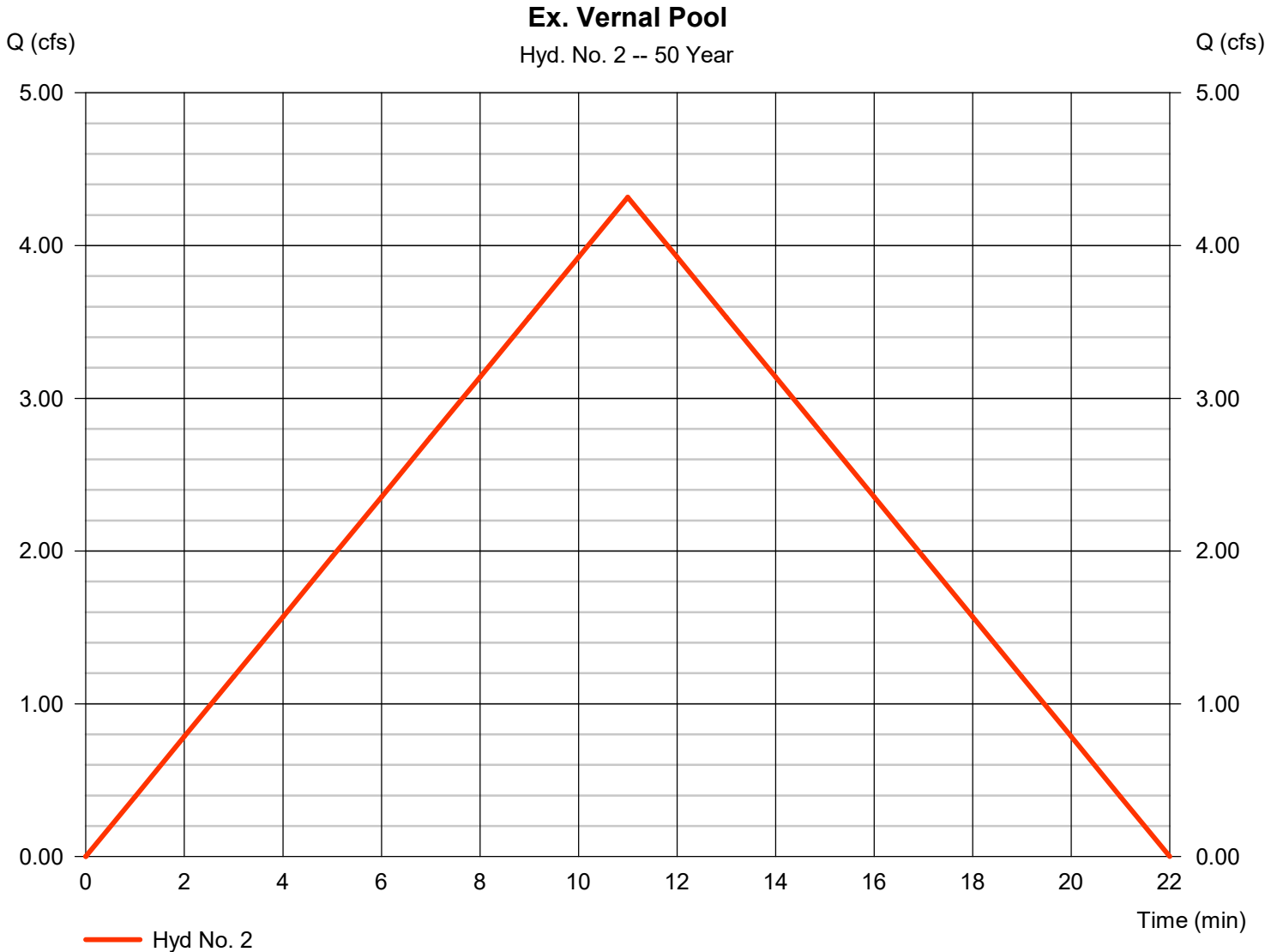
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## Hyd. No. 2

Ex. Vernal Pool

|                 |                                  |                 |              |
|-----------------|----------------------------------|-----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 4.316 cfs  |
| Storm frequency | = 50 yrs                         | Time to peak    | = 11 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 2,849 cuft |
| Drainage area   | = 4.220 ac                       | Runoff coeff.   | = 0.16       |
| Intensity       | = 6.393 in/hr                    | Tc by User      | = 11.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1        |



# Hydrograph Report

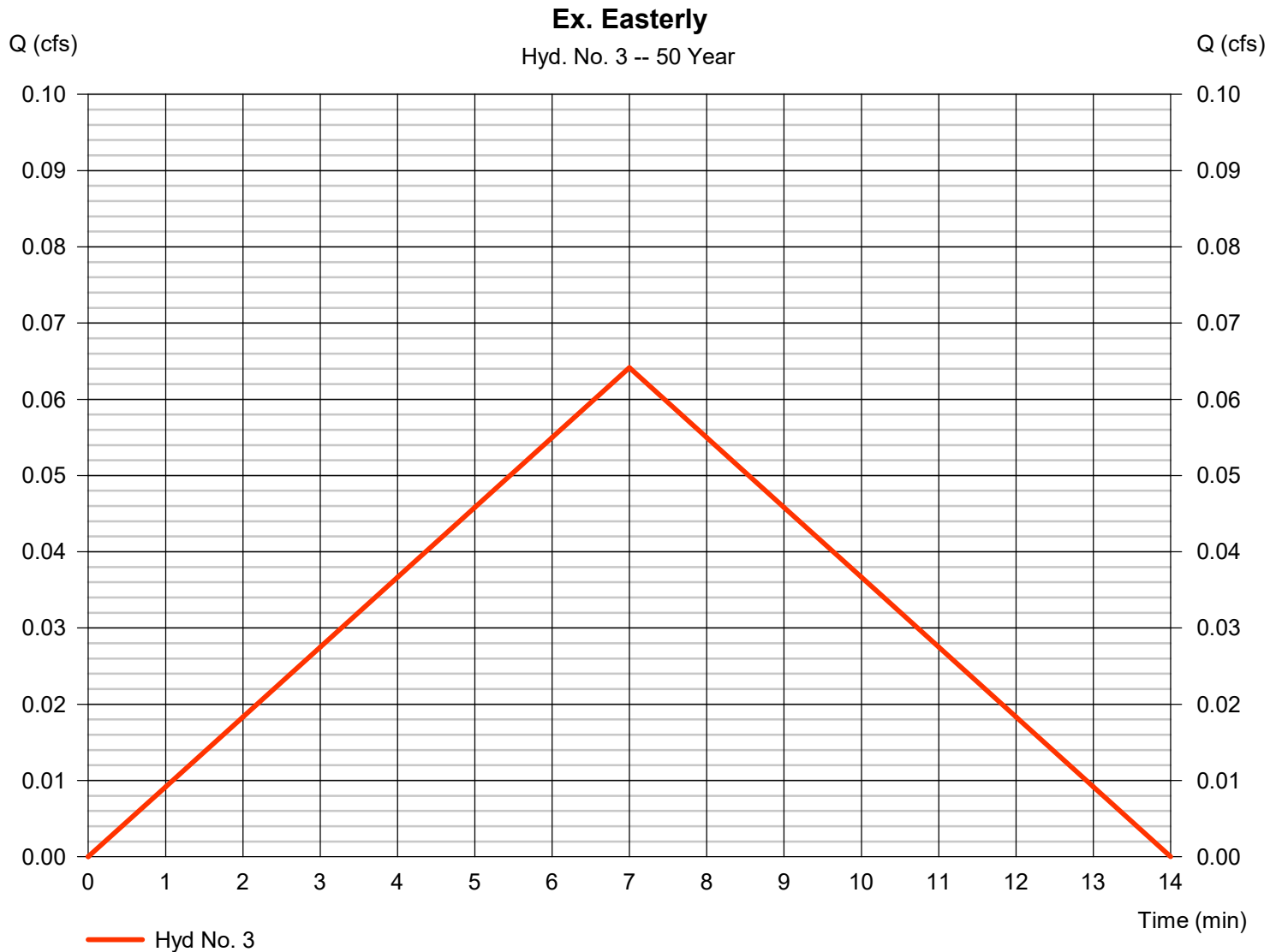
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## Hyd. No. 3

Ex. Easterly

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 0.064 cfs |
| Storm frequency | = 50 yrs                         | Time to peak    | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 27 cuft   |
| Drainage area   | = 0.080 ac                       | Runoff coeff.   | = 0.1       |
| Intensity       | = 8.017 in/hr                    | Tc by User      | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

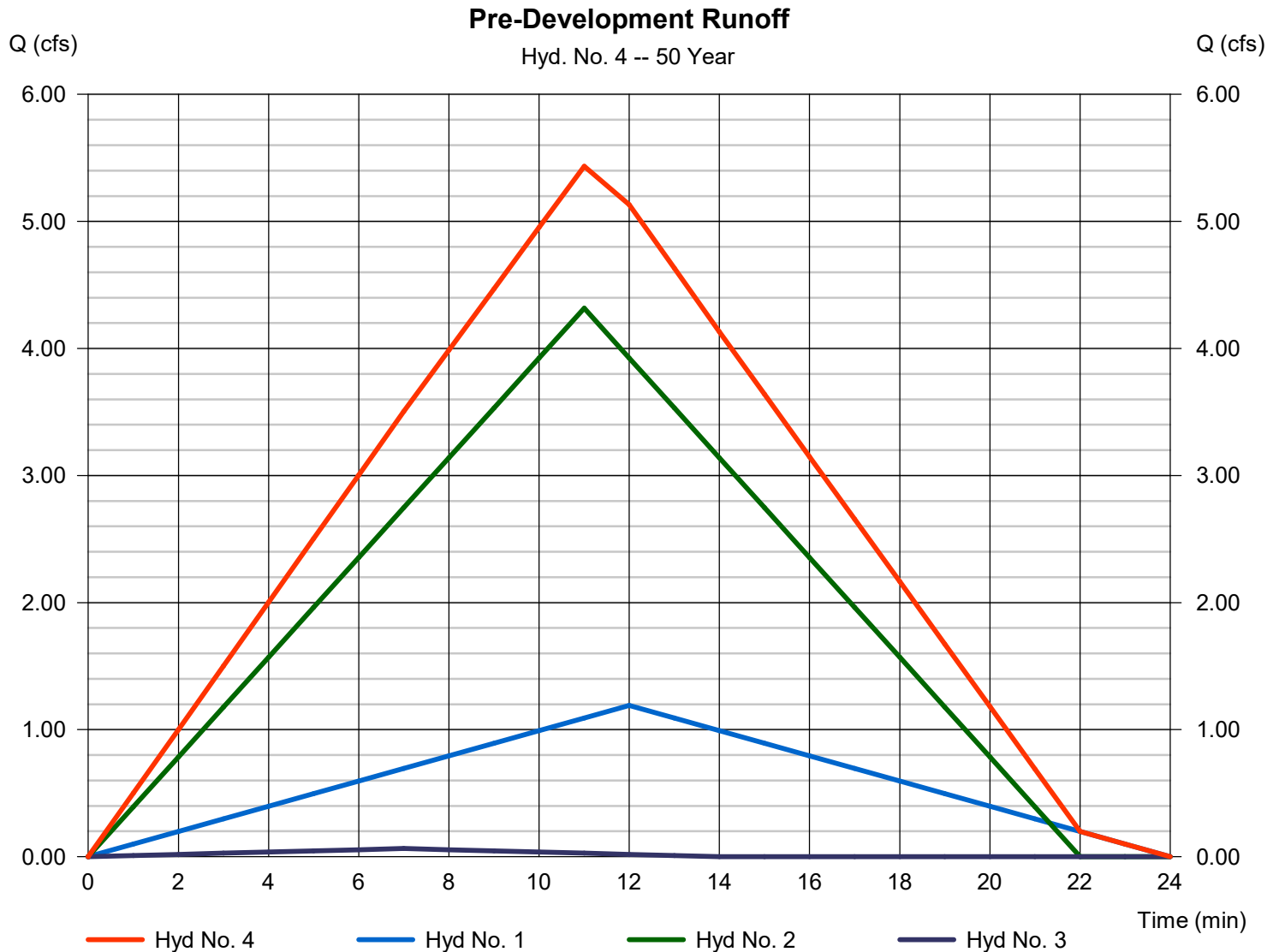
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## Hyd. No. 4

### Pre-Development Runoff

Hydrograph type = Combine  
Storm frequency = 50 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2, 3

Peak discharge = 5.435 cfs  
Time to peak = 11 min  
Hyd. volume = 3,732 cuft  
Contrib. drain. area = 6.250 ac



# Hydrograph Report

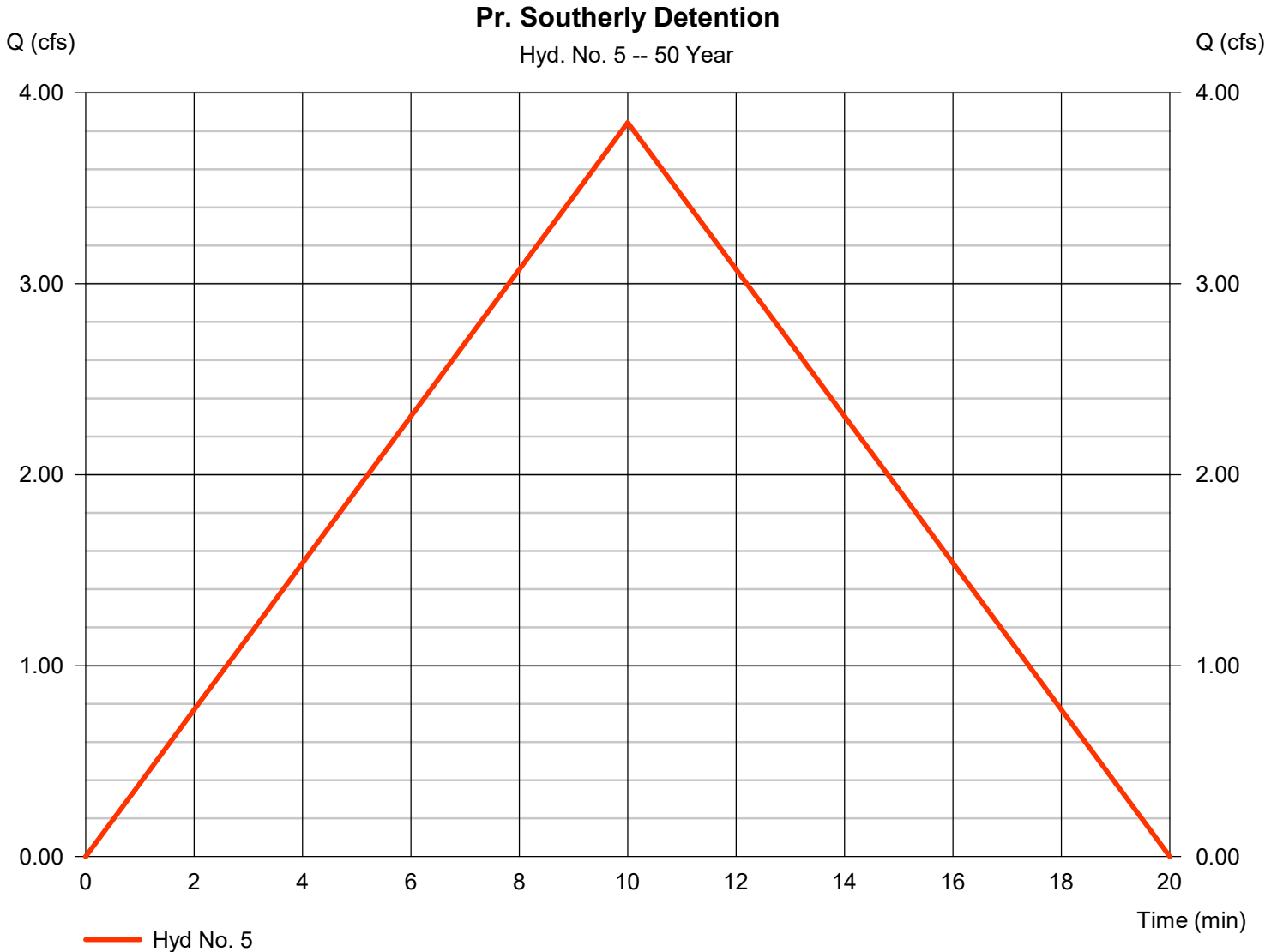
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## Hyd. No. 5

Pr. Southerly Detention

|                 |                                  |                                       |              |
|-----------------|----------------------------------|---------------------------------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge                        | = 3.844 cfs  |
| Storm frequency | = 50 yrs                         | Time to peak                          | = 10 min     |
| Time interval   | = 1 min                          | Hyd. volume                           | = 2,306 cuft |
| Drainage area   | = 1.330 ac                       | Runoff coeff.                         | = 0.43       |
| Intensity       | = 6.721 in/hr                    | Tc by User                            | = 10.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | Q <sub>5</sub> /Q <sub>100</sub> Fact | = 1/1        |



# Hydrograph Report

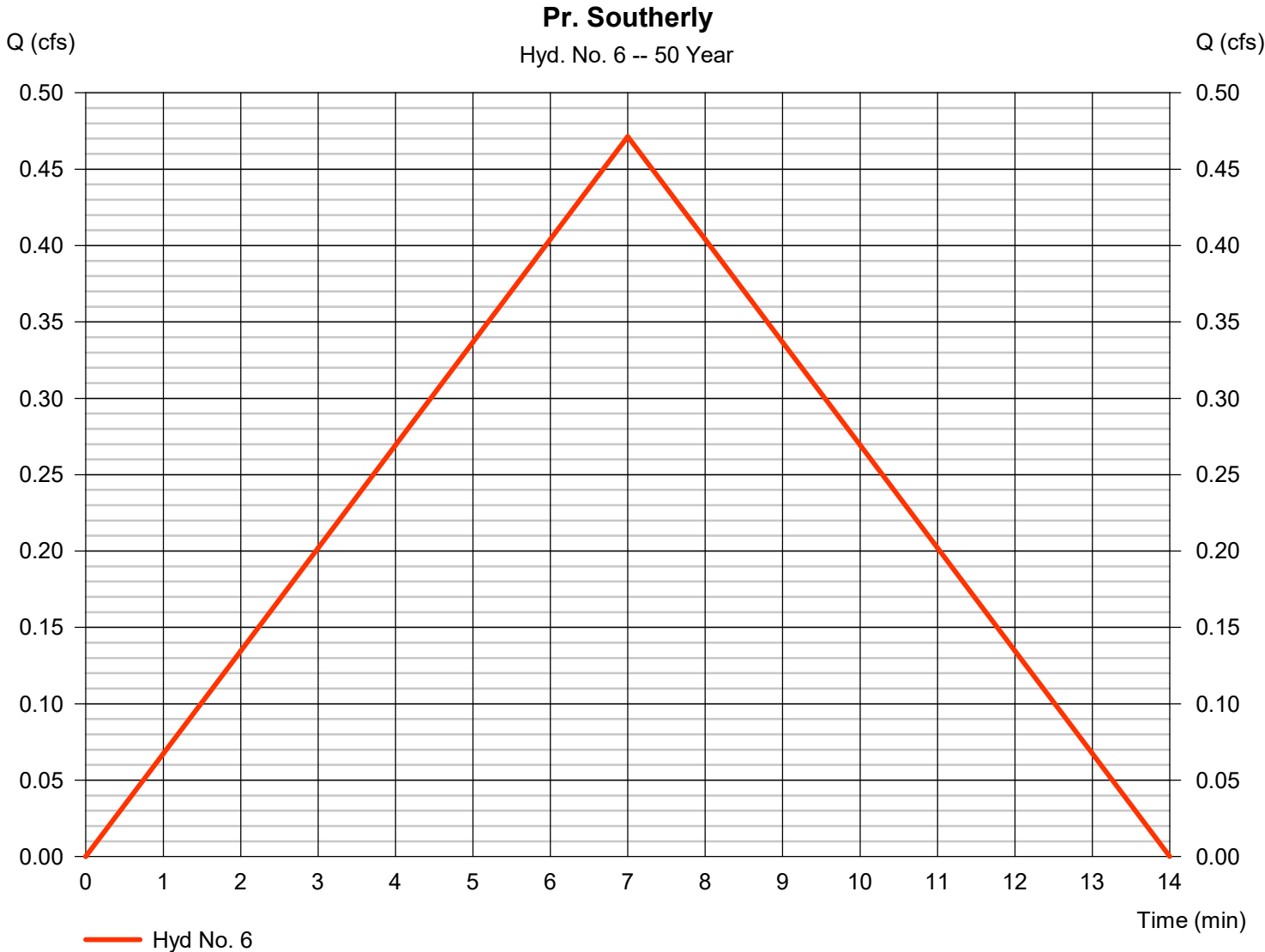
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Monday, 11 / 20 / 2023

## Hyd. No. 6

Pr. Southerly

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge | = 0.471 cfs |
| Storm frequency | = 50 yrs                         | Time to peak   | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume    | = 198 cuft  |
| Drainage area   | = 0.490 ac                       | Runoff coeff.  | = 0.12      |
| Intensity       | = 8.017 in/hr                    | Tc by User     | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Coef/IDF    | = 1/1       |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

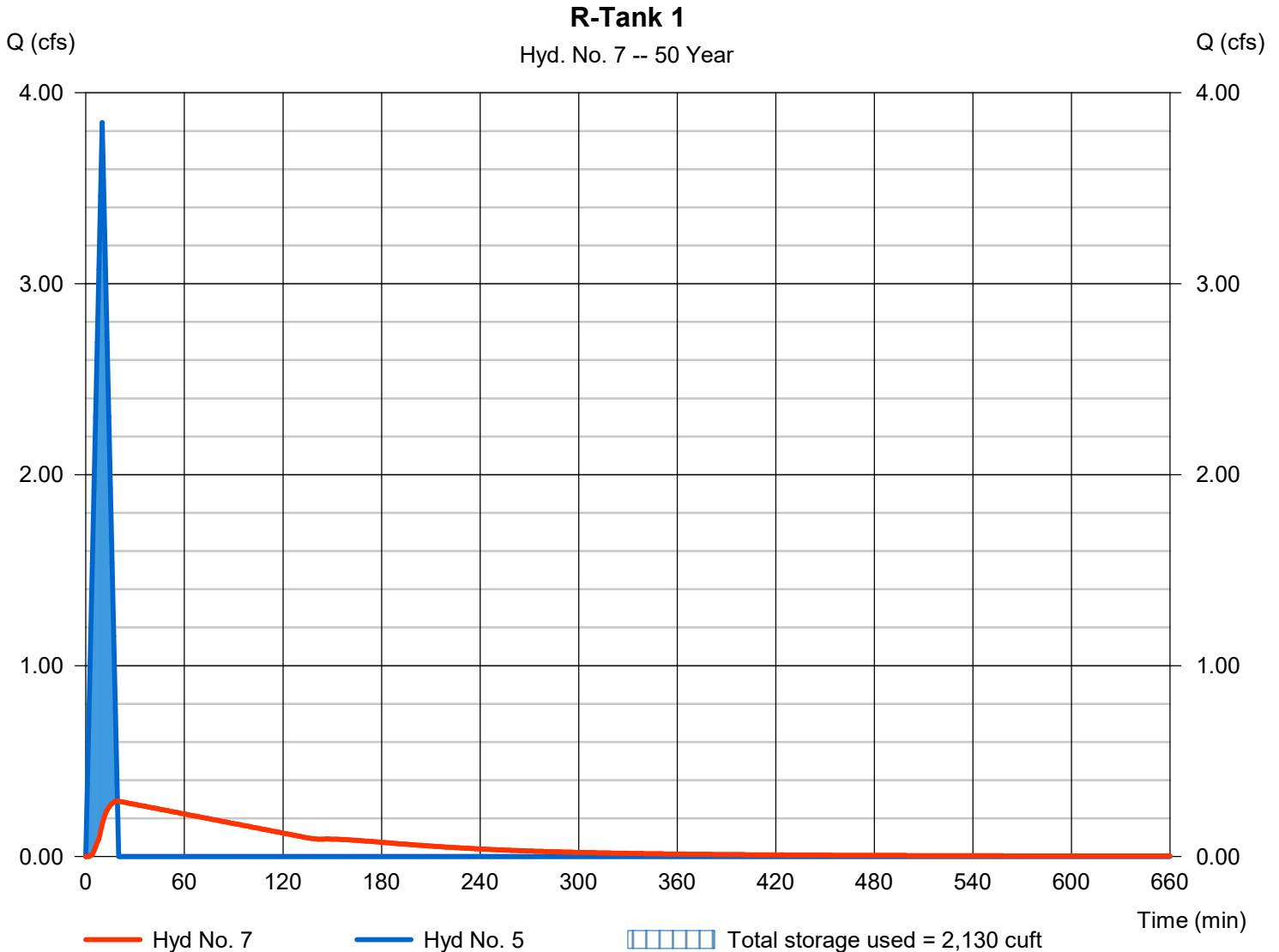
Monday, 11 / 20 / 2023

## Hyd. No. 7

R-Tank 1

|                 |                                |                |              |
|-----------------|--------------------------------|----------------|--------------|
| Hydrograph type | = Reservoir                    | Peak discharge | = 0.290 cfs  |
| Storm frequency | = 50 yrs                       | Time to peak   | = 19 min     |
| Time interval   | = 1 min                        | Hyd. volume    | = 2,258 cuft |
| Inflow hyd. No. | = 5 - Pr. Southerly Detention  | Max. Elevation | = 673.44 ft  |
| Reservoir name  | = Southerly Watershed R-Tank 1 | Max. Storage   | = 2,130 cuft |

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 8

Pr. Easterly

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 1.010 cfs |
| Storm frequency | = 50 yrs                         | Time to peak    | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 424 cuft  |
| Drainage area   | = 0.300 ac                       | Runoff coeff.   | = 0.42      |
| Intensity       | = 8.017 in/hr                    | Tc by User      | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |



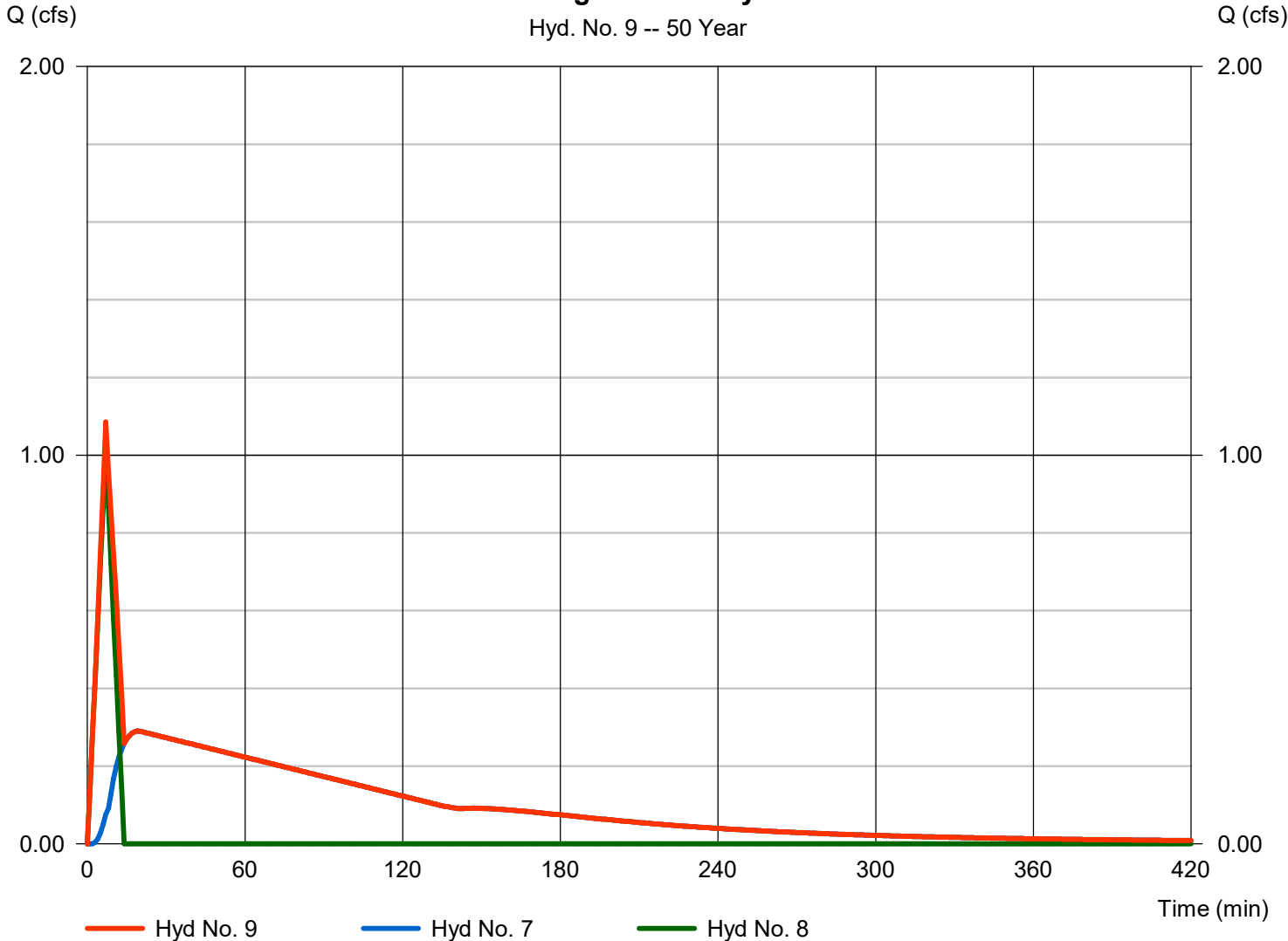
# Hydrograph Report

## Hyd. No. 9

R-Tank discharge to Easterly Watershed

|                 |           |                      |              |
|-----------------|-----------|----------------------|--------------|
| Hydrograph type | = Combine | Peak discharge       | = 1.086 cfs  |
| Storm frequency | = 50 yrs  | Time to peak         | = 7 min      |
| Time interval   | = 1 min   | Hyd. volume          | = 2,683 cuft |
| Inflow hyds.    | = 7, 8    | Contrib. drain. area | = 0.300 ac   |

R-Tank discharge to Easterly Watershed





# Hydrograph Report

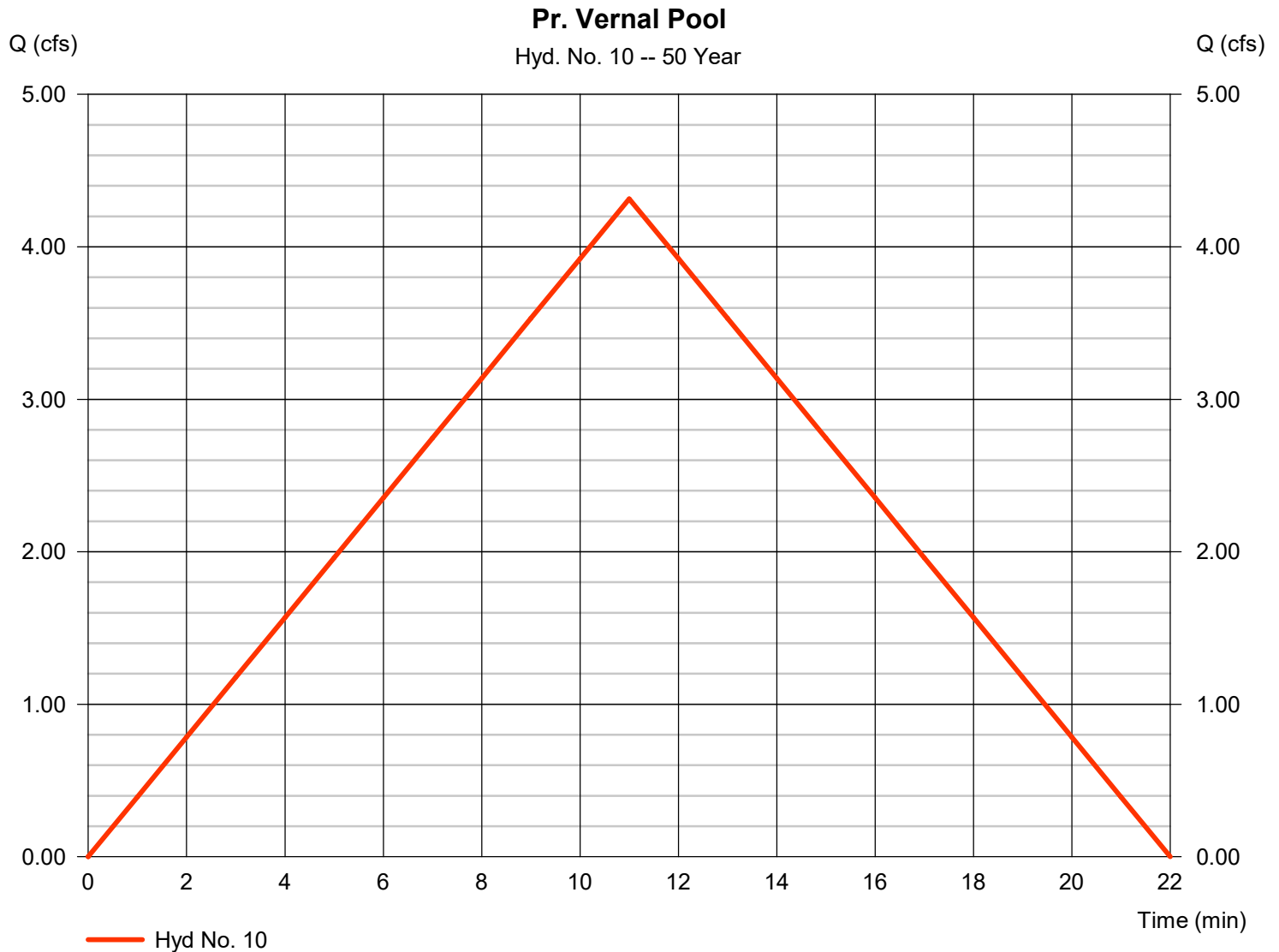
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## Hyd. No. 10

Pr. Vernal Pool

|                 |                                  |                 |              |
|-----------------|----------------------------------|-----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 4.315 cfs  |
| Storm frequency | = 50 yrs                         | Time to peak    | = 11 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 2,848 cuft |
| Drainage area   | = 3.750 ac                       | Runoff coeff.   | = 0.18       |
| Intensity       | = 6.393 in/hr                    | Tc by User      | = 11.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1        |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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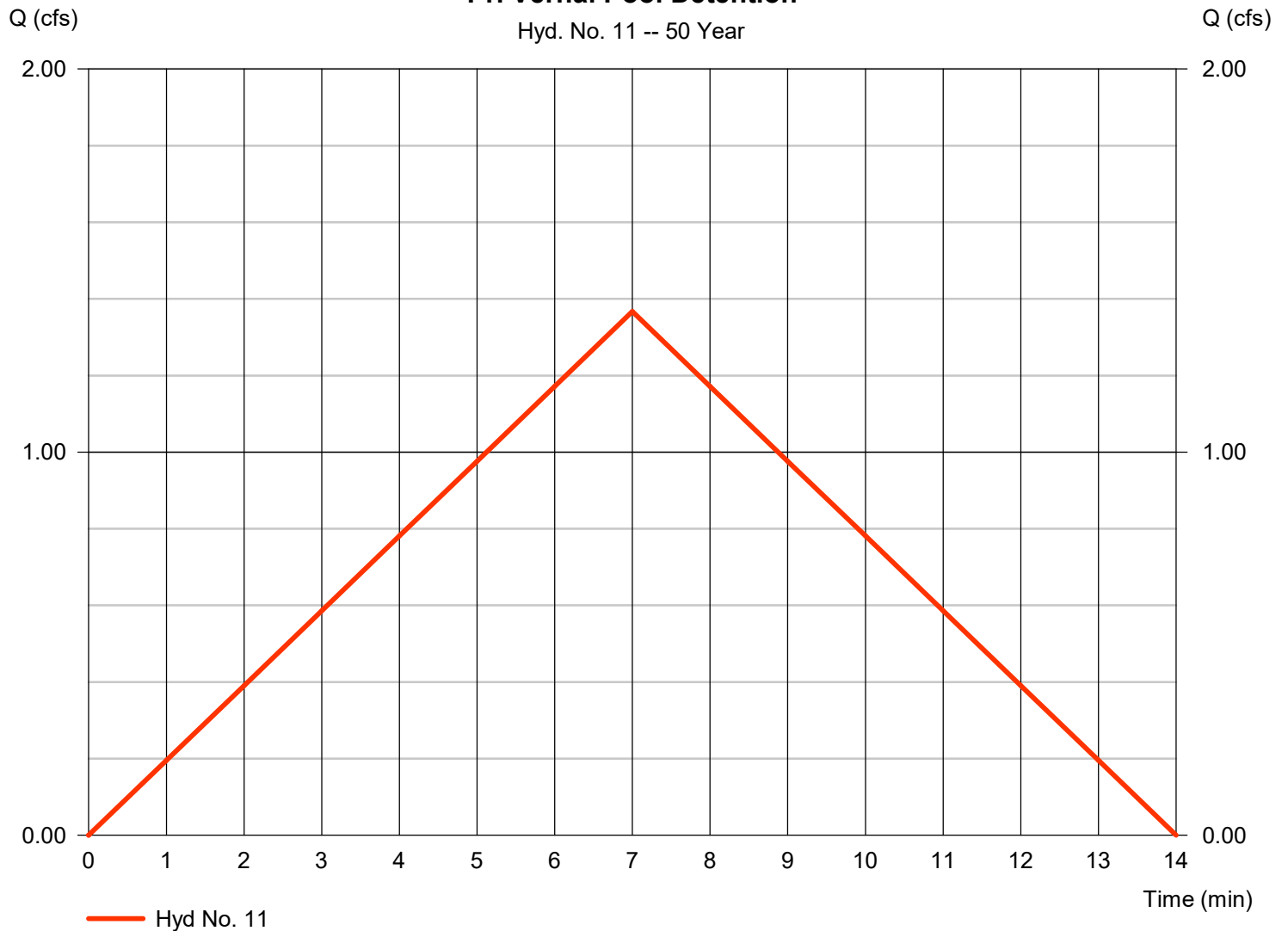
## Hyd. No. 11

Pr. Vernal Pool Detention

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 1.367 cfs |
| Storm frequency | = 50 yrs                         | Time to peak    | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 574 cuft  |
| Drainage area   | = 0.550 ac                       | Runoff coeff.   | = 0.31      |
| Intensity       | = 8.017 in/hr                    | Tc by User      | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |

### Pr. Vernal Pool Detention

Hyd. No. 11 -- 50 Year



# Hydrograph Report

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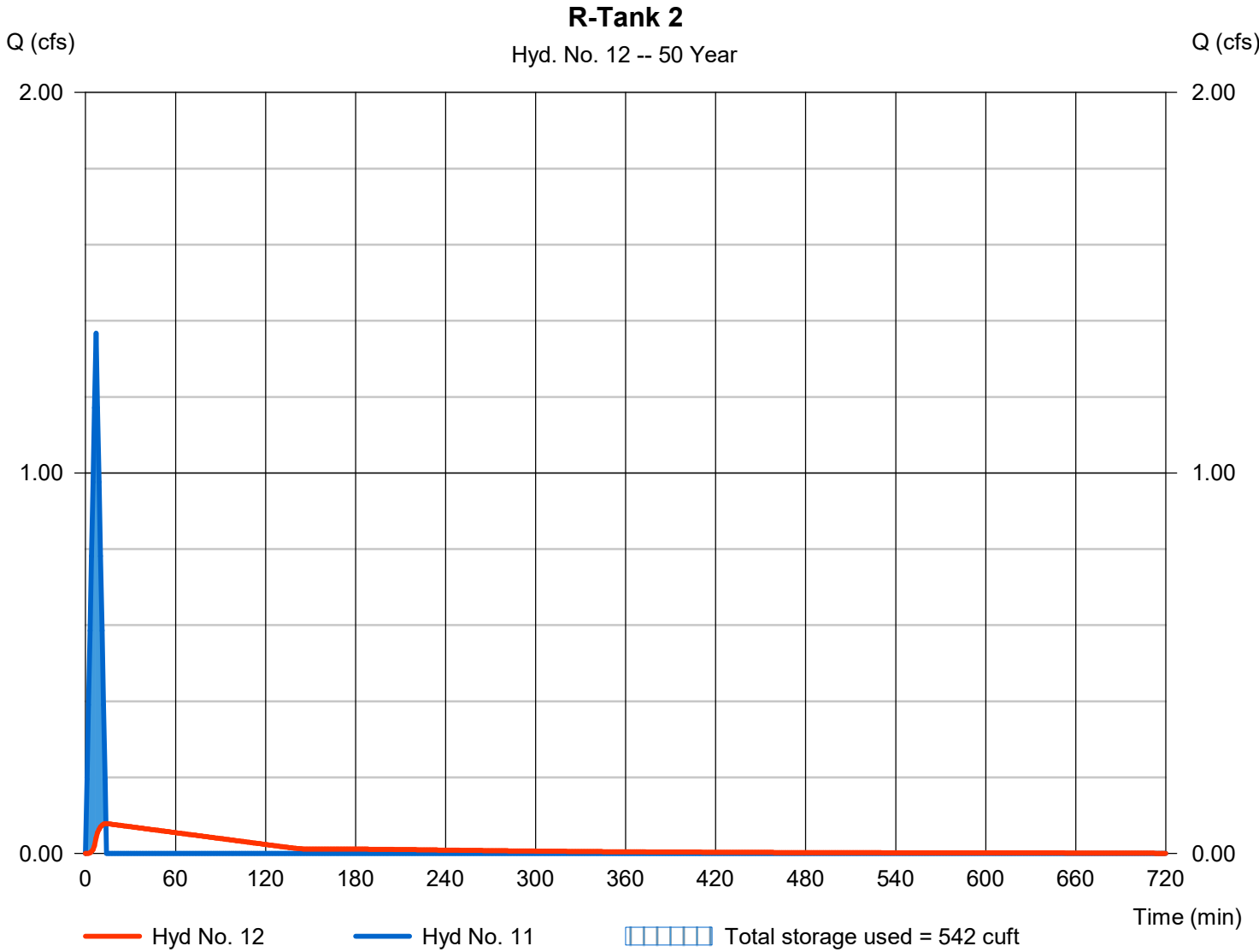
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## Hyd. No. 12

R-Tank 2

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Reservoir                      | Peak discharge | = 0.079 cfs |
| Storm frequency | = 50 yrs                         | Time to peak   | = 14 min    |
| Time interval   | = 1 min                          | Hyd. volume    | = 536 cuft  |
| Inflow hyd. No. | = 11 - Pr. Vernal Pool Detention | Max. Elevation | = 672.44 ft |
| Reservoir name  | = Vernal Pool Watershed R-Tank   | Max. Storage   | = 542 cuft  |

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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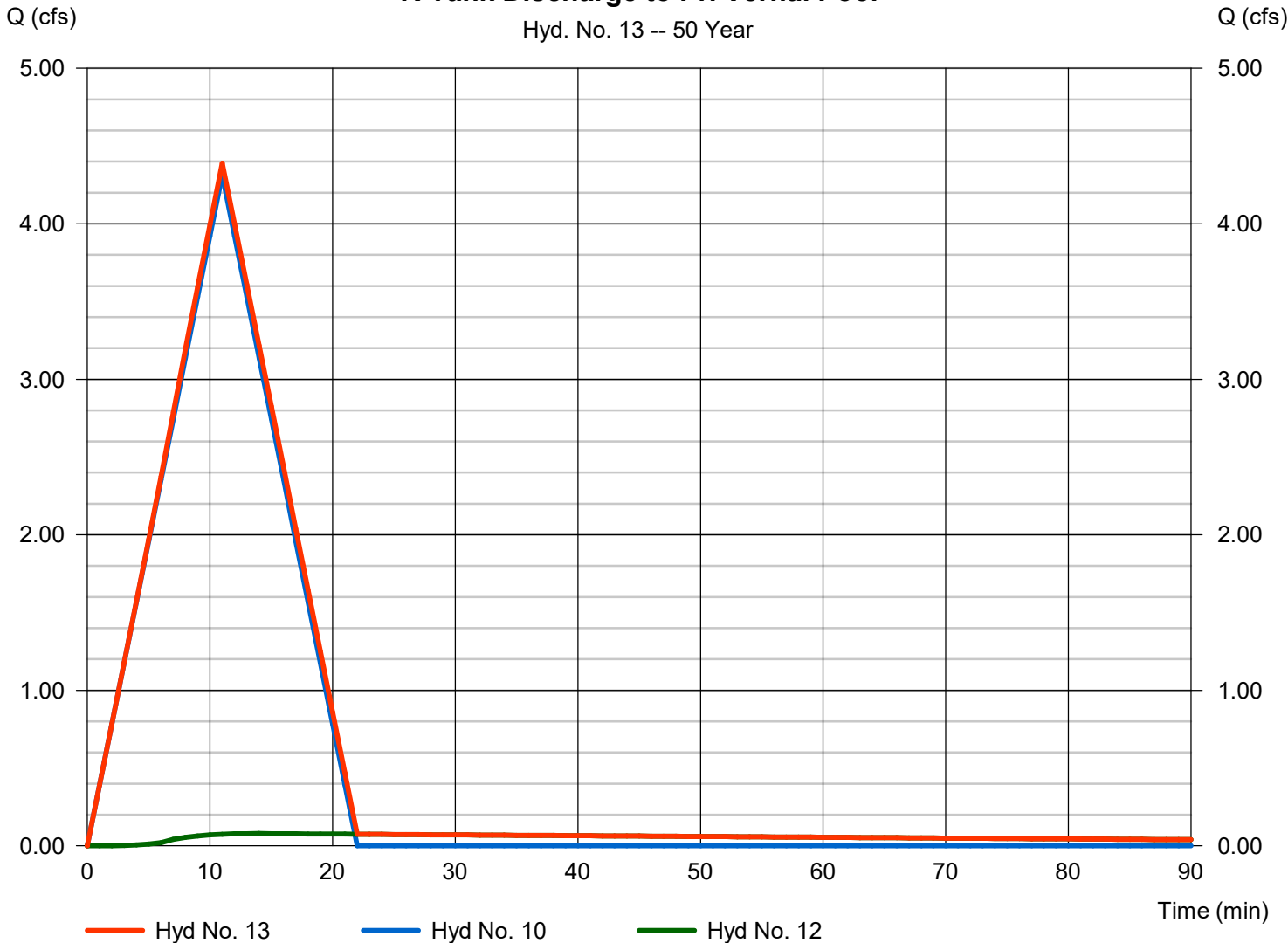
## Hyd. No. 13

R-Tank Discharge to Pr. Vernal Pool

|                 |           |                      |              |
|-----------------|-----------|----------------------|--------------|
| Hydrograph type | = Combine | Peak discharge       | = 4.389 cfs  |
| Storm frequency | = 50 yrs  | Time to peak         | = 11 min     |
| Time interval   | = 1 min   | Hyd. volume          | = 3,384 cuft |
| Inflow hyds.    | = 10, 12  | Contrib. drain. area | = 3.750 ac   |

### R-Tank Discharge to Pr. Vernal Pool

Hyd. No. 13 -- 50 Year



# Hydrograph Report

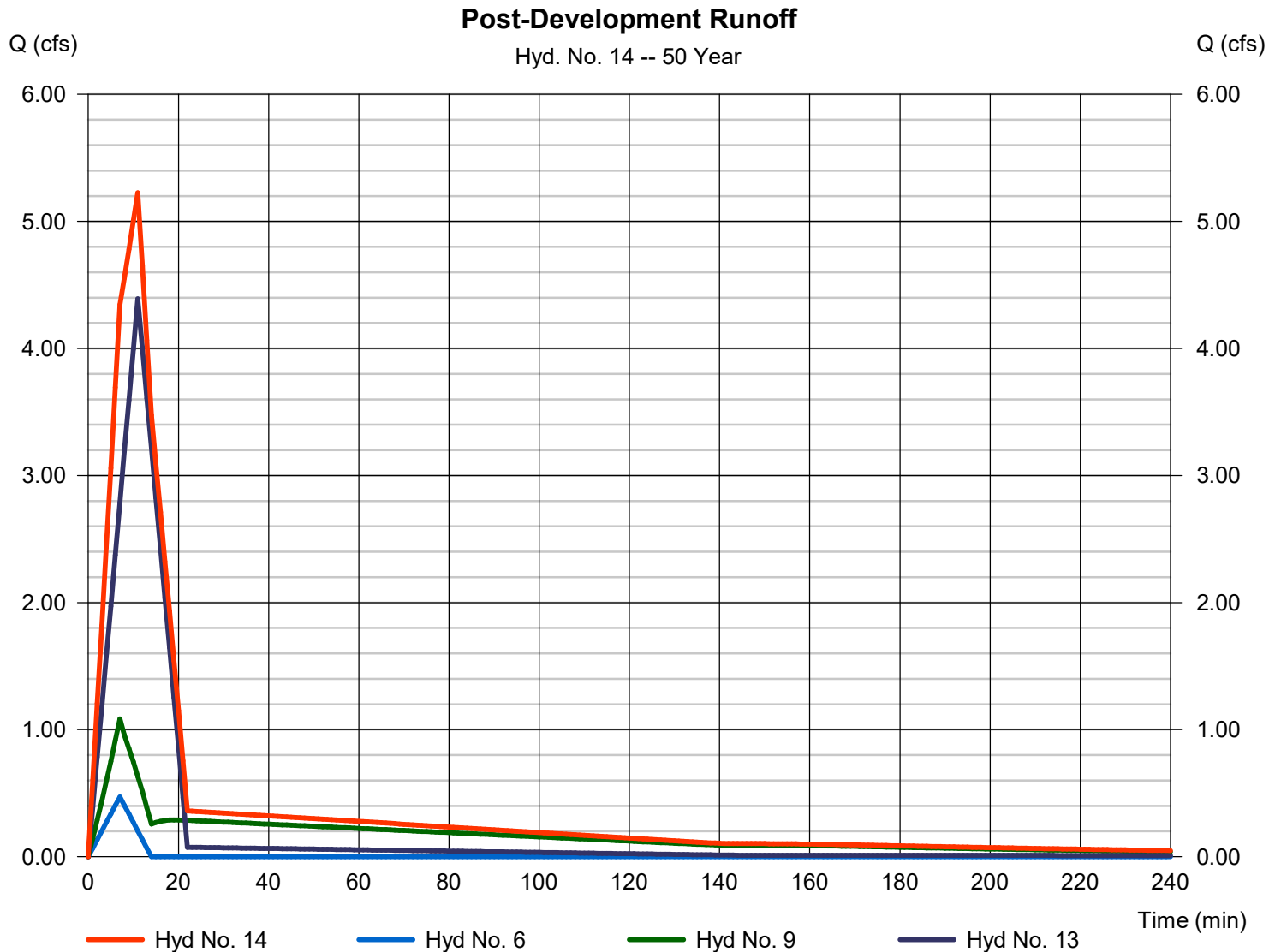
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## Hyd. No. 14

### Post-Development Runoff

|                 |            |                      |              |
|-----------------|------------|----------------------|--------------|
| Hydrograph type | = Combine  | Peak discharge       | = 5.224 cfs  |
| Storm frequency | = 50 yrs   | Time to peak         | = 11 min     |
| Time interval   | = 1 min    | Hyd. volume          | = 6,264 cuft |
| Inflow hyds.    | = 6, 9, 13 | Contrib. drain. area | = 0.490 ac   |



# Hydrograph Report

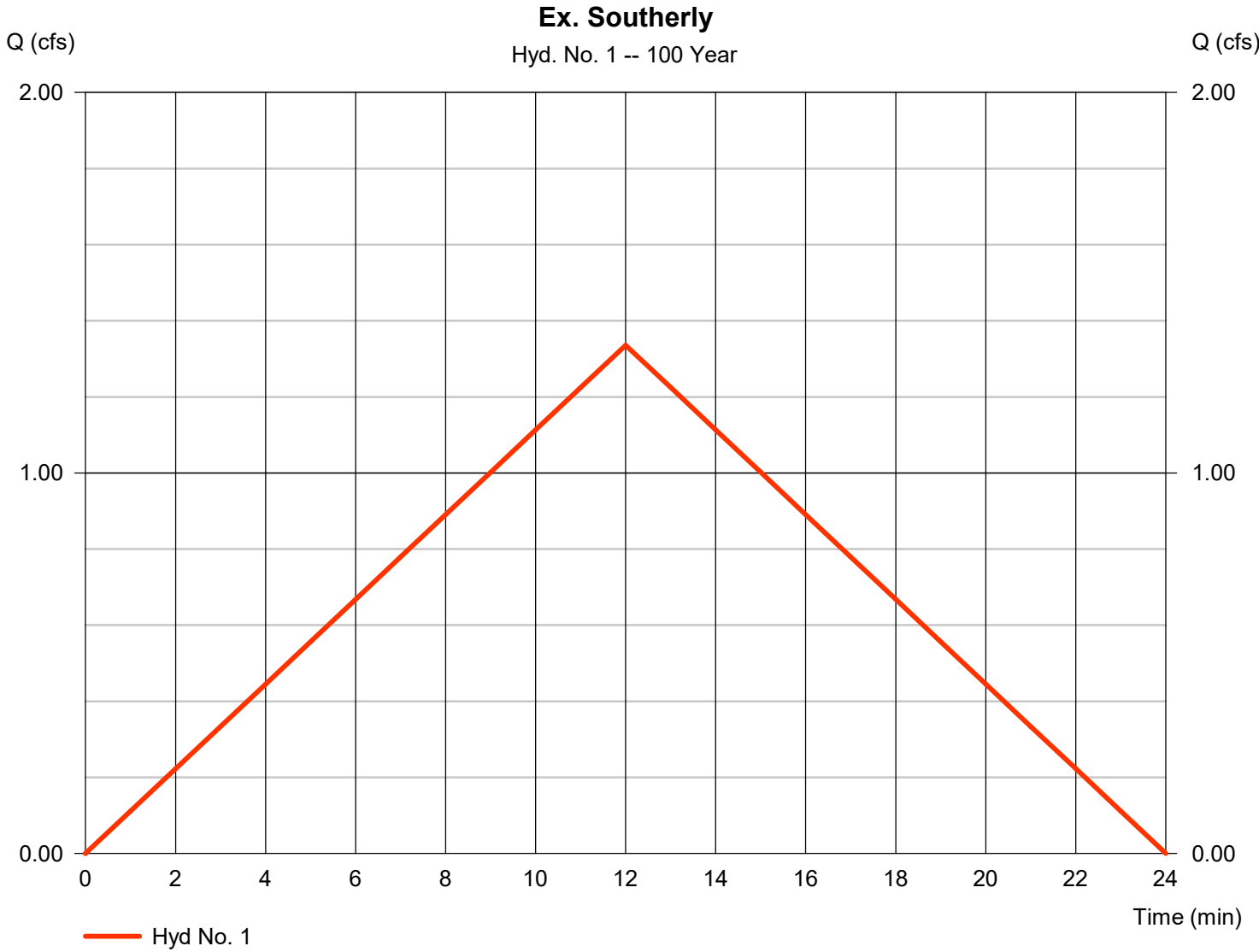
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## Hyd. No. 1

Ex. Southerly

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 1.336 cfs |
| Storm frequency | = 100 yrs                        | Time to peak    | = 12 min    |
| Time interval   | = 1 min                          | Hyd. volume     | = 962 cuft  |
| Drainage area   | = 1.950 ac                       | Runoff coeff.   | = 0.1       |
| Intensity       | = 6.850 in/hr                    | Tc by User      | = 12.00 min |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |



# Hydrograph Report

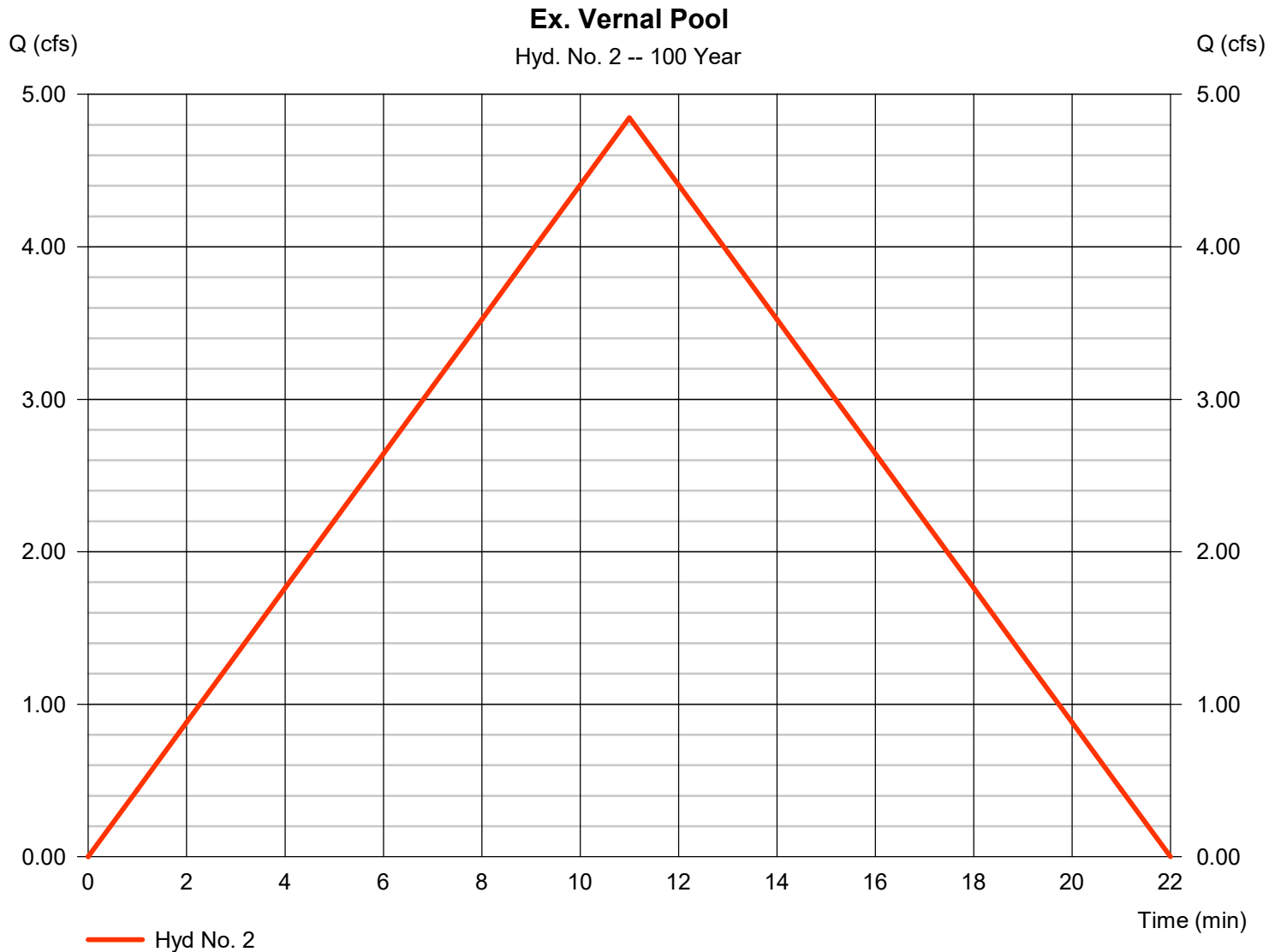
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## Hyd. No. 2

Ex. Vernal Pool

|                 |                                  |                 |              |
|-----------------|----------------------------------|-----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 4.846 cfs  |
| Storm frequency | = 100 yrs                        | Time to peak    | = 11 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 3,199 cuft |
| Drainage area   | = 4.220 ac                       | Runoff coeff.   | = 0.16       |
| Intensity       | = 7.178 in/hr                    | Tc by User      | = 11.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1        |



# Hydrograph Report

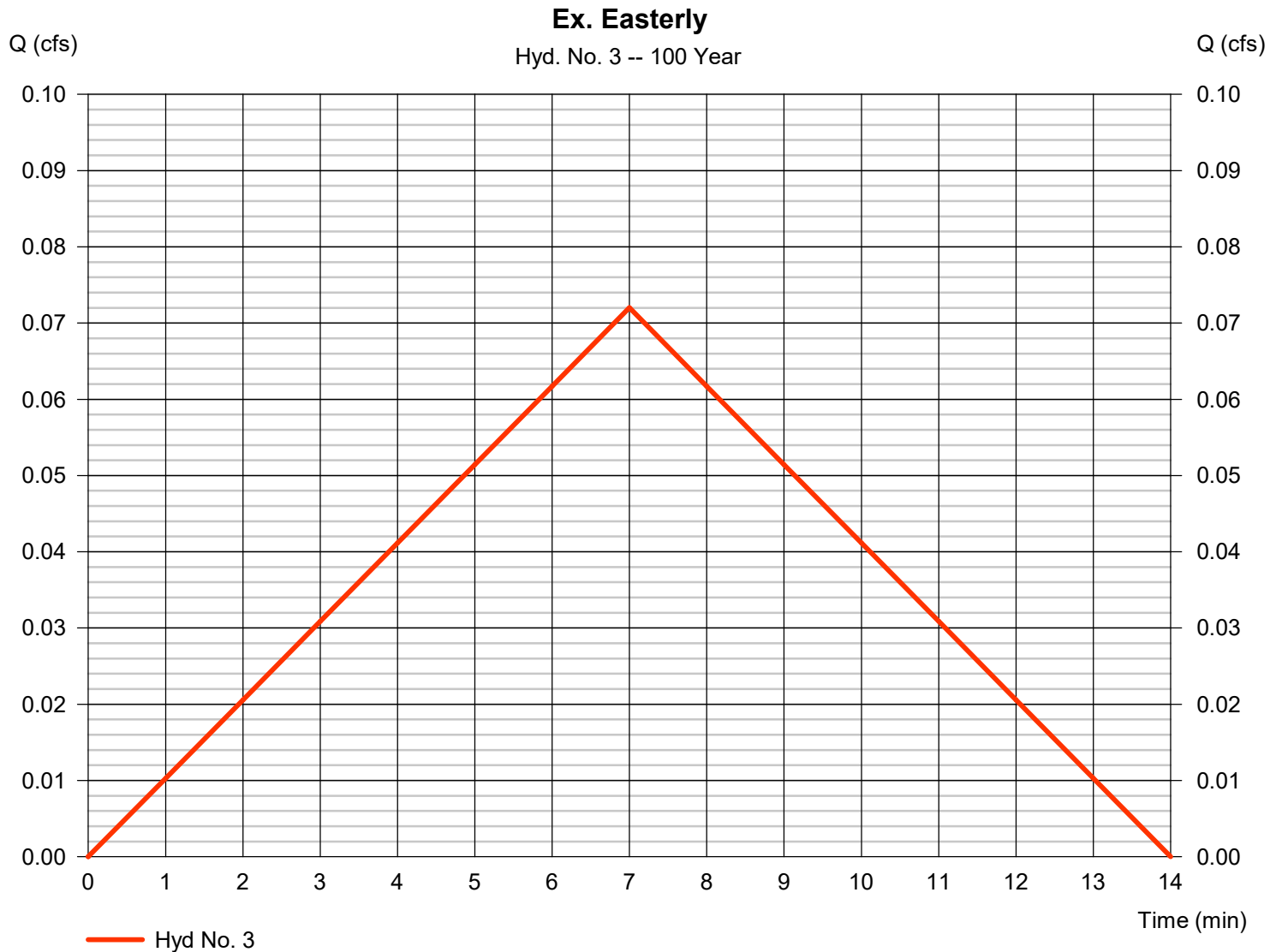
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## Hyd. No. 3

Ex. Easterly

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 0.072 cfs |
| Storm frequency | = 100 yrs                        | Time to peak    | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 30 cuft   |
| Drainage area   | = 0.080 ac                       | Runoff coeff.   | = 0.1       |
| Intensity       | = 9.001 in/hr                    | Tc by User      | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |





# Hydrograph Report

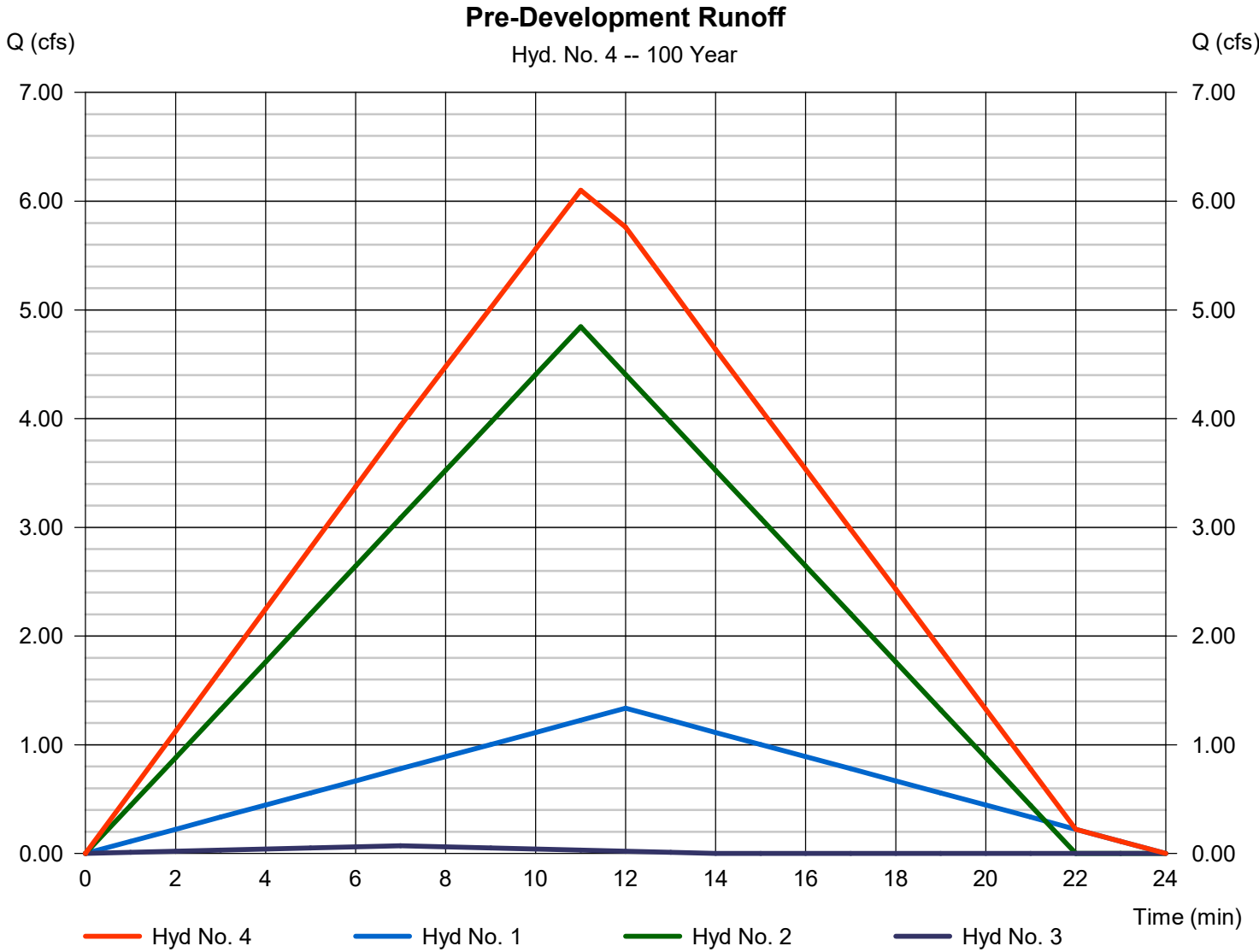
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## Hyd. No. 4

### Pre-Development Runoff

|                 |           |                      |              |
|-----------------|-----------|----------------------|--------------|
| Hydrograph type | = Combine | Peak discharge       | = 6.102 cfs  |
| Storm frequency | = 100 yrs | Time to peak         | = 11 min     |
| Time interval   | = 1 min   | Hyd. volume          | = 4,191 cuft |
| Inflow hyds.    | = 1, 2, 3 | Contrib. drain. area | = 6.250 ac   |



# Hydrograph Report

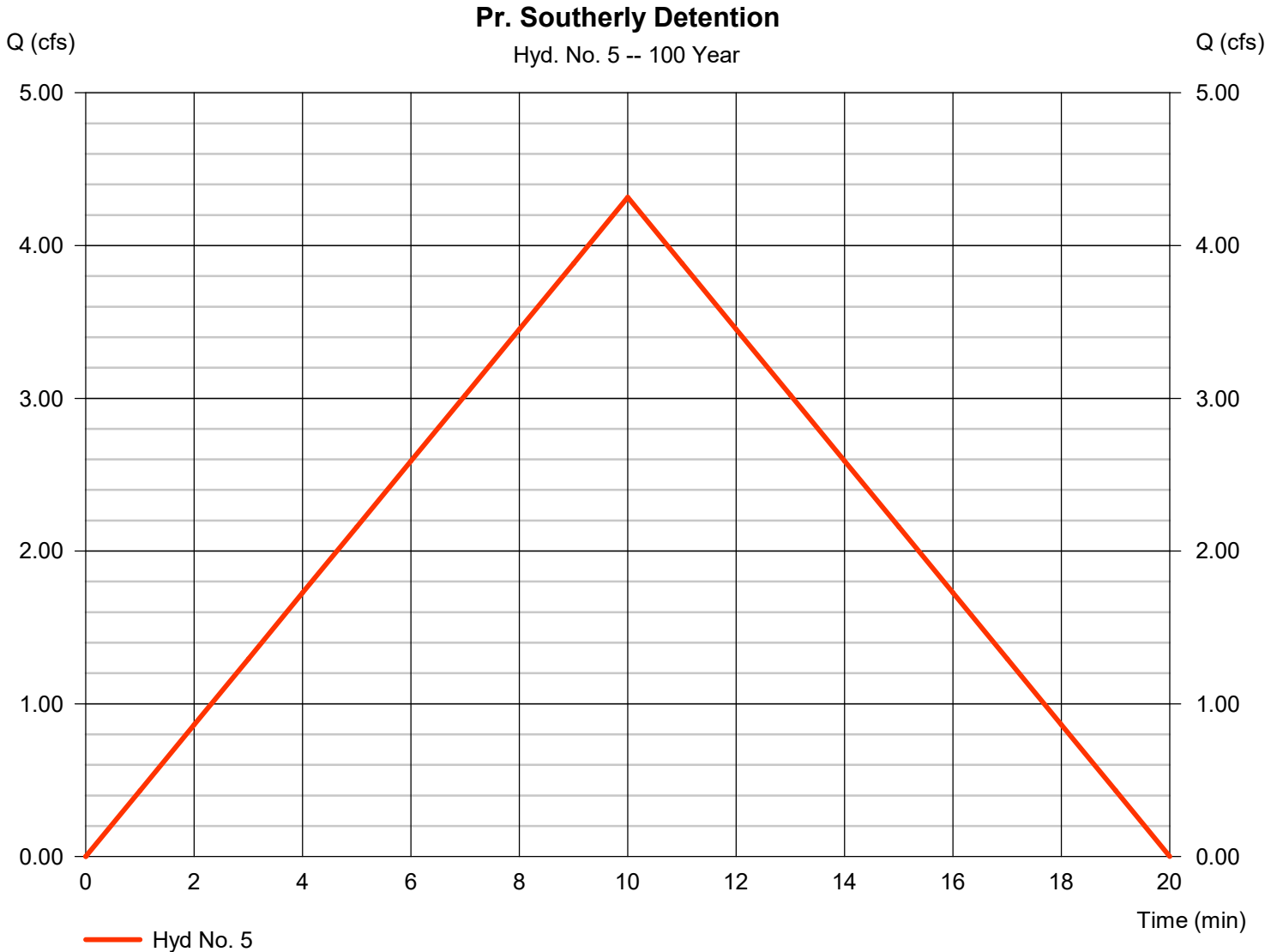
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## Hyd. No. 5

Pr. Southerly Detention

|                 |                                  |                 |              |
|-----------------|----------------------------------|-----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 4.316 cfs  |
| Storm frequency | = 100 yrs                        | Time to peak    | = 10 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 2,589 cuft |
| Drainage area   | = 1.330 ac                       | Runoff coeff.   | = 0.43       |
| Intensity       | = 7.546 in/hr                    | Tc by User      | = 10.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1        |



# Hydrograph Report

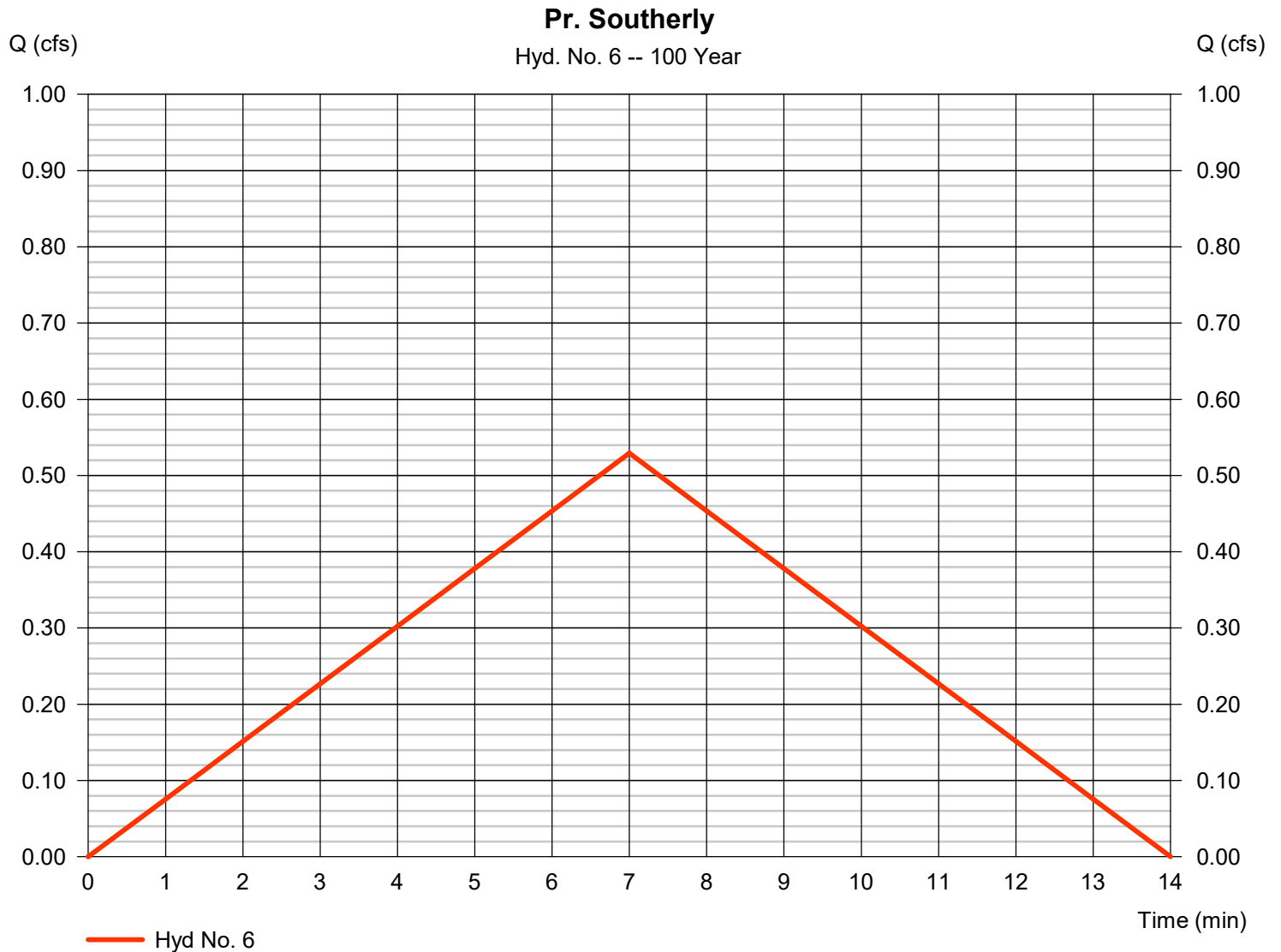
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## Hyd. No. 6

Pr. Southerly

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge | = 0.529 cfs |
| Storm frequency | = 100 yrs                        | Time to peak   | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume    | = 222 cuft  |
| Drainage area   | = 0.490 ac                       | Runoff coeff.  | = 0.12      |
| Intensity       | = 9.001 in/hr                    | Tc by User     | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revol/Dfact | = 1/1       |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

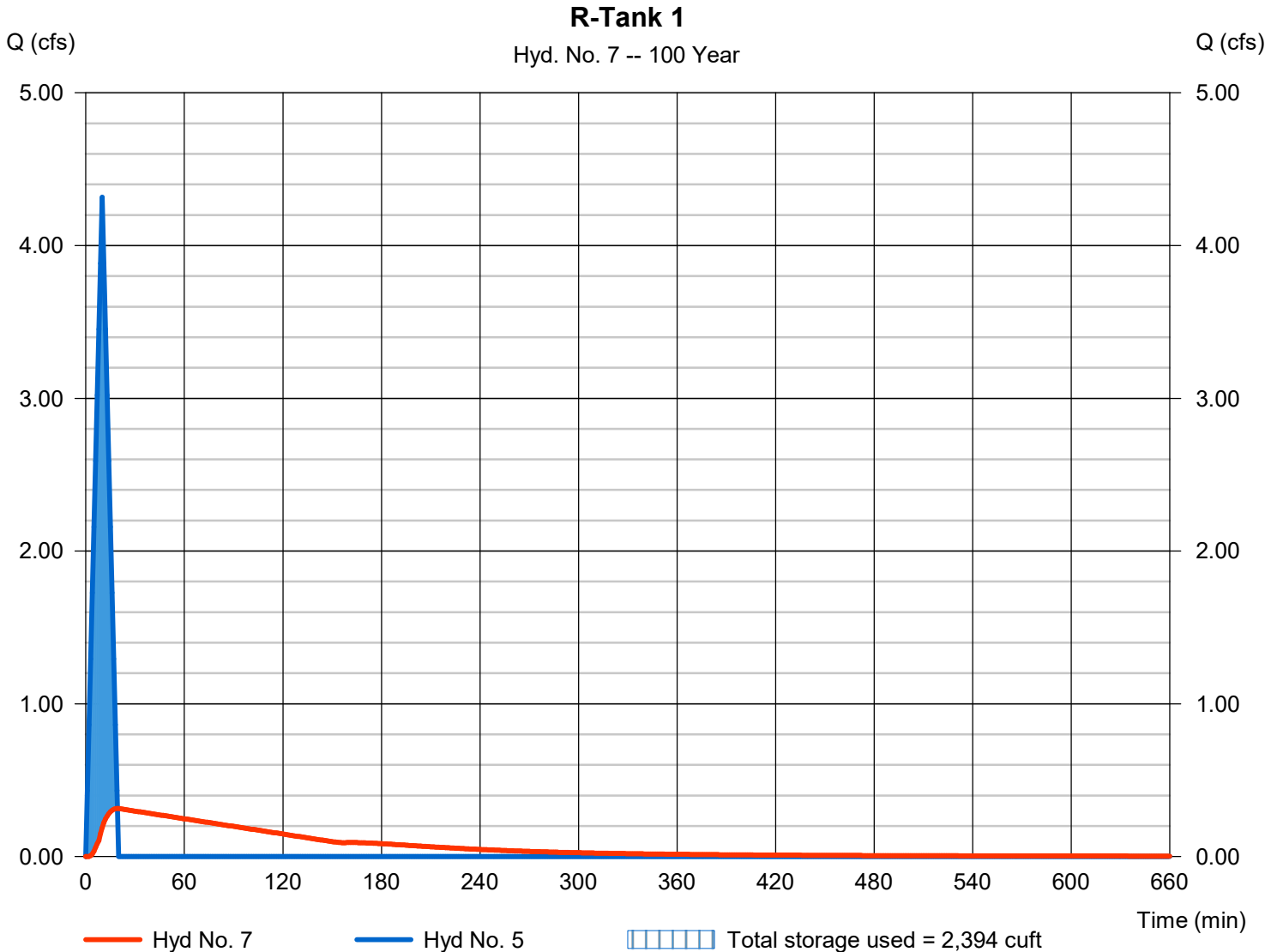
Monday, 11 / 20 / 2023

## Hyd. No. 7

R-Tank 1

|                 |                                |                |              |
|-----------------|--------------------------------|----------------|--------------|
| Hydrograph type | = Reservoir                    | Peak discharge | = 0.315 cfs  |
| Storm frequency | = 100 yrs                      | Time to peak   | = 19 min     |
| Time interval   | = 1 min                        | Hyd. volume    | = 2,541 cuft |
| Inflow hyd. No. | = 5 - Pr. Southerly Detention  | Max. Elevation | = 673.56 ft  |
| Reservoir name  | = Southerly Watershed R-Tank 1 | Max. Storage   | = 2,394 cuft |

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 8

Pr. Easterly

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 1.134 cfs |
| Storm frequency | = 100 yrs                        | Time to peak    | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 476 cuft  |
| Drainage area   | = 0.300 ac                       | Runoff coeff.   | = 0.42      |
| Intensity       | = 9.001 in/hr                    | Tc by User      | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

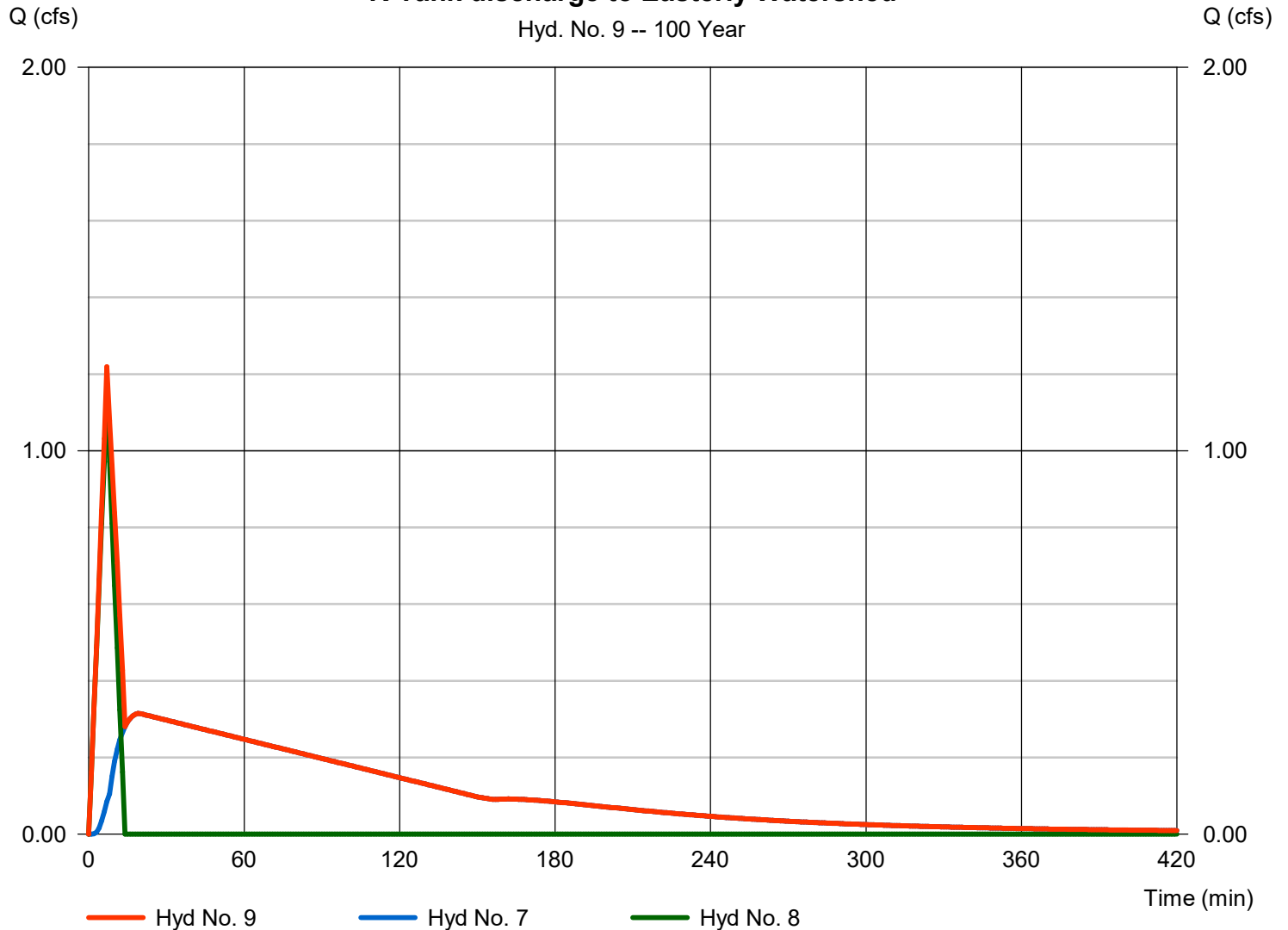
Monday, 11 / 20 / 2023

## Hyd. No. 9

R-Tank discharge to Easterly Watershed

|                 |           |                      |              |
|-----------------|-----------|----------------------|--------------|
| Hydrograph type | = Combine | Peak discharge       | = 1.219 cfs  |
| Storm frequency | = 100 yrs | Time to peak         | = 7 min      |
| Time interval   | = 1 min   | Hyd. volume          | = 3,018 cuft |
| Inflow hyds.    | = 7, 8    | Contrib. drain. area | = 0.300 ac   |

### R-Tank discharge to Easterly Watershed



# Hydrograph Report

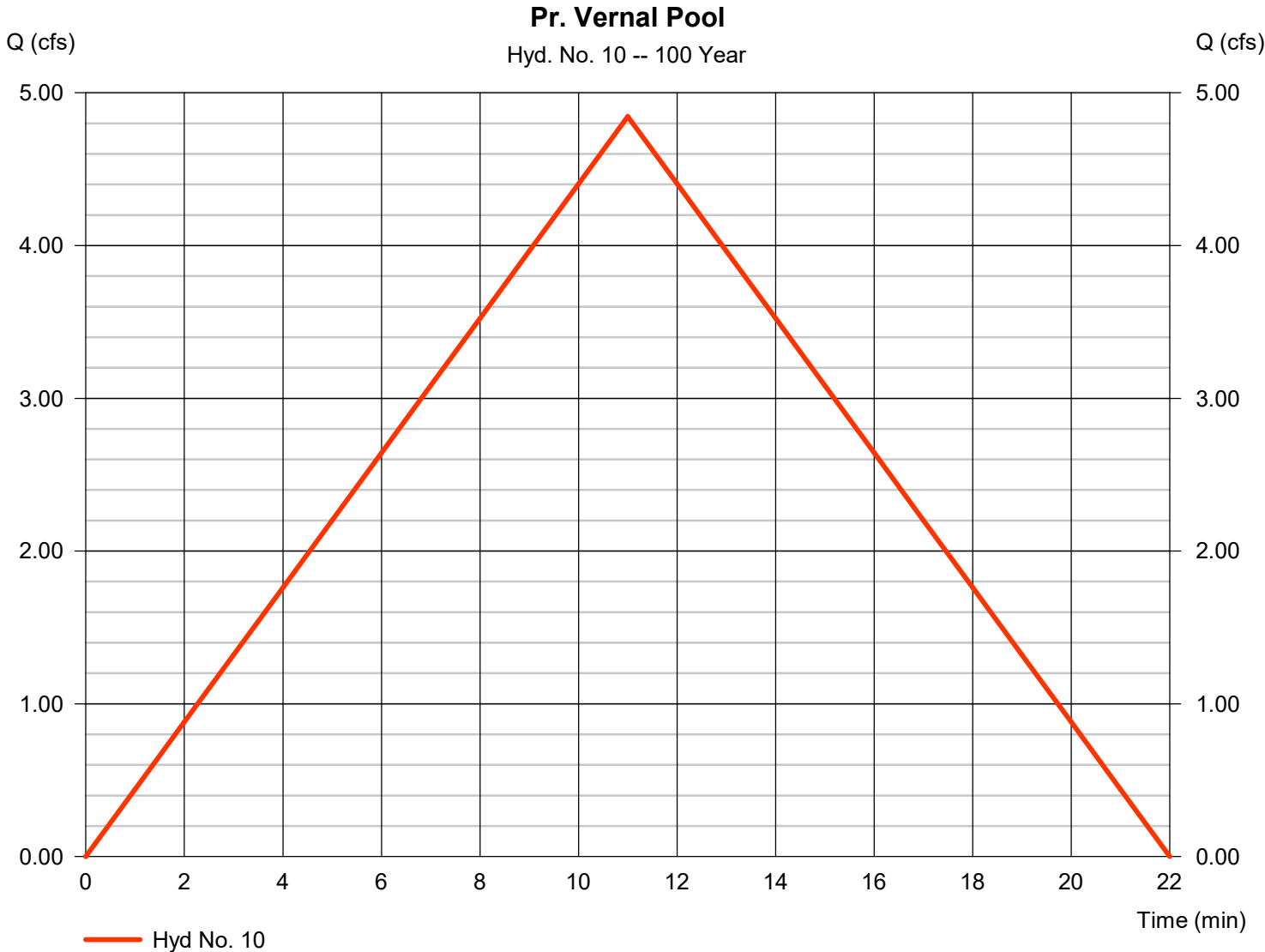
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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## Hyd. No. 10

Pr. Vernal Pool

|                 |                                  |                 |              |
|-----------------|----------------------------------|-----------------|--------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 4.845 cfs  |
| Storm frequency | = 100 yrs                        | Time to peak    | = 11 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 3,198 cuft |
| Drainage area   | = 3.750 ac                       | Runoff coeff.   | = 0.18       |
| Intensity       | = 7.178 in/hr                    | Tc by User      | = 11.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1        |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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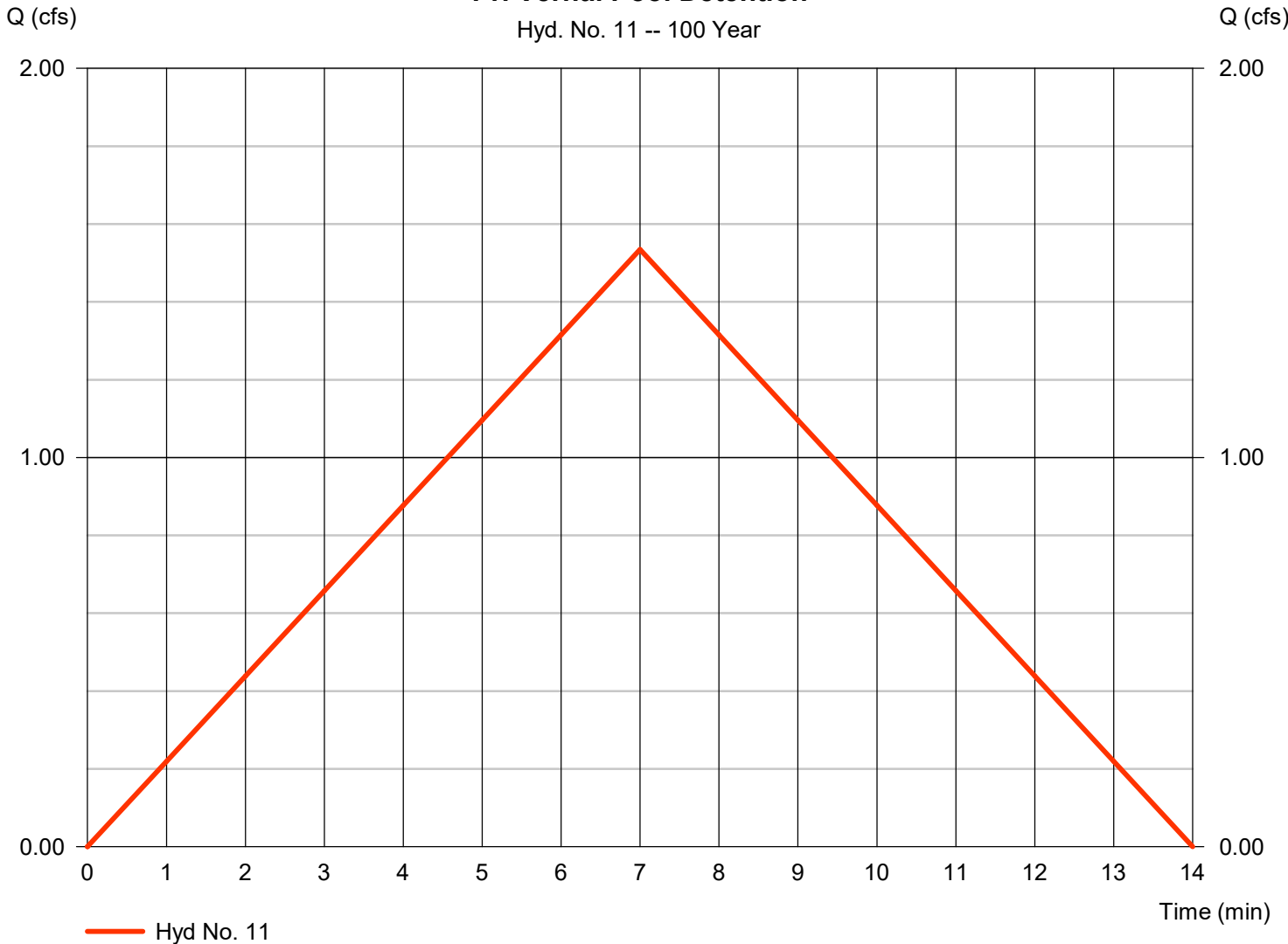
## Hyd. No. 11

Pr. Vernal Pool Detention

|                 |                                  |                 |             |
|-----------------|----------------------------------|-----------------|-------------|
| Hydrograph type | = Rational                       | Peak discharge  | = 1.535 cfs |
| Storm frequency | = 100 yrs                        | Time to peak    | = 7 min     |
| Time interval   | = 1 min                          | Hyd. volume     | = 645 cuft  |
| Drainage area   | = 0.550 ac                       | Runoff coeff.   | = 0.31      |
| Intensity       | = 9.001 in/hr                    | Tc by User      | = 7.00 min  |
| IDF Curve       | = Railroad Street, Salisbury, CT | CE/Revised Fact | = 1/1       |

Pr. Vernal Pool Detention

Hyd. No. 11 -- 100 Year





# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

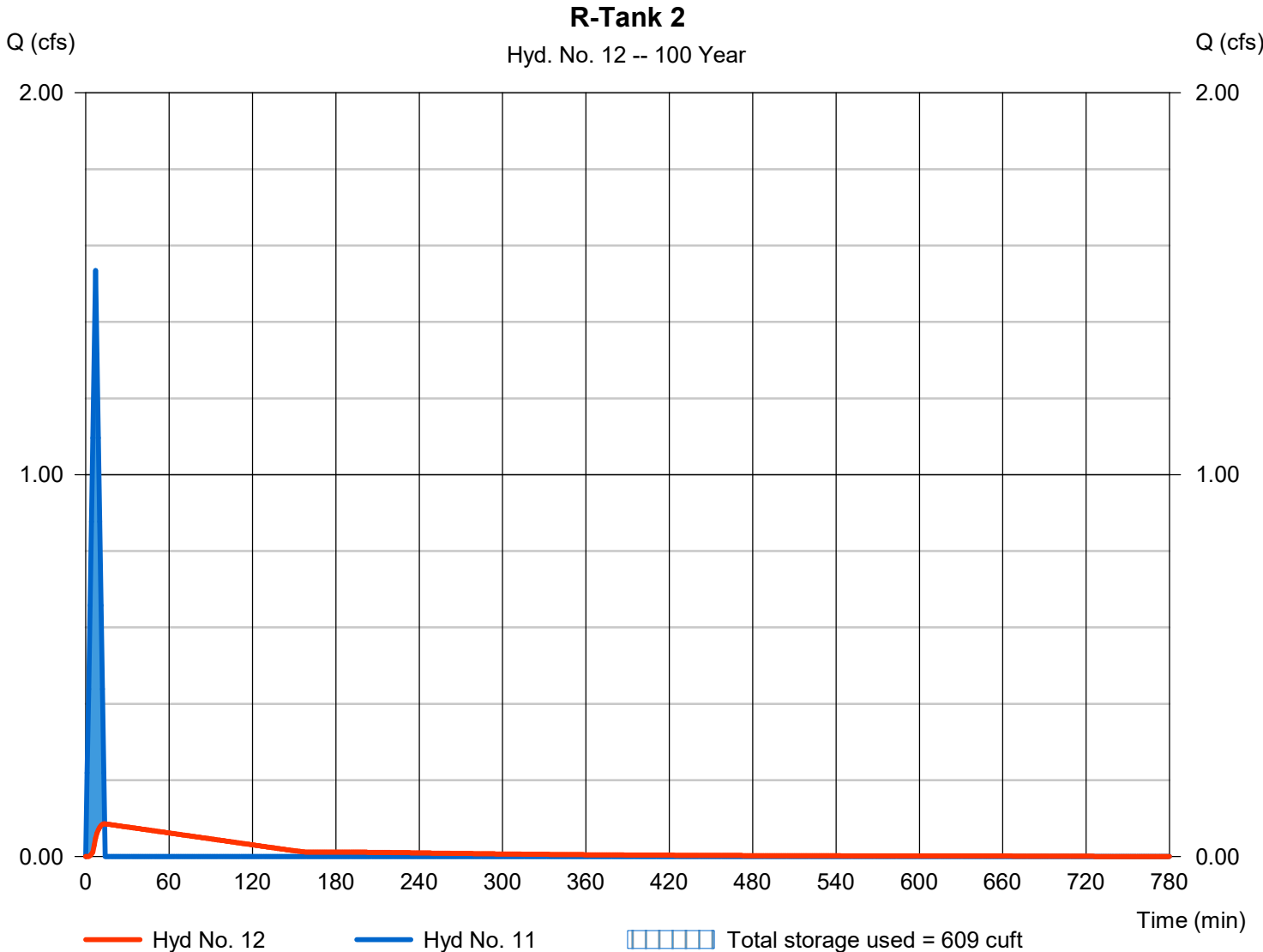
Monday, 11 / 20 / 2023

## Hyd. No. 12

R-Tank 2

|                 |                                  |                |             |
|-----------------|----------------------------------|----------------|-------------|
| Hydrograph type | = Reservoir                      | Peak discharge | = 0.086 cfs |
| Storm frequency | = 100 yrs                        | Time to peak   | = 14 min    |
| Time interval   | = 1 min                          | Hyd. volume    | = 606 cuft  |
| Inflow hyd. No. | = 11 - Pr. Vernal Pool Detention | Max. Elevation | = 672.56 ft |
| Reservoir name  | = Vernal Pool Watershed R-Tank 2 | Max. Storage   | = 609 cuft  |

Storage Indication method used.



# Hydrograph Report

## Hyd. No. 13

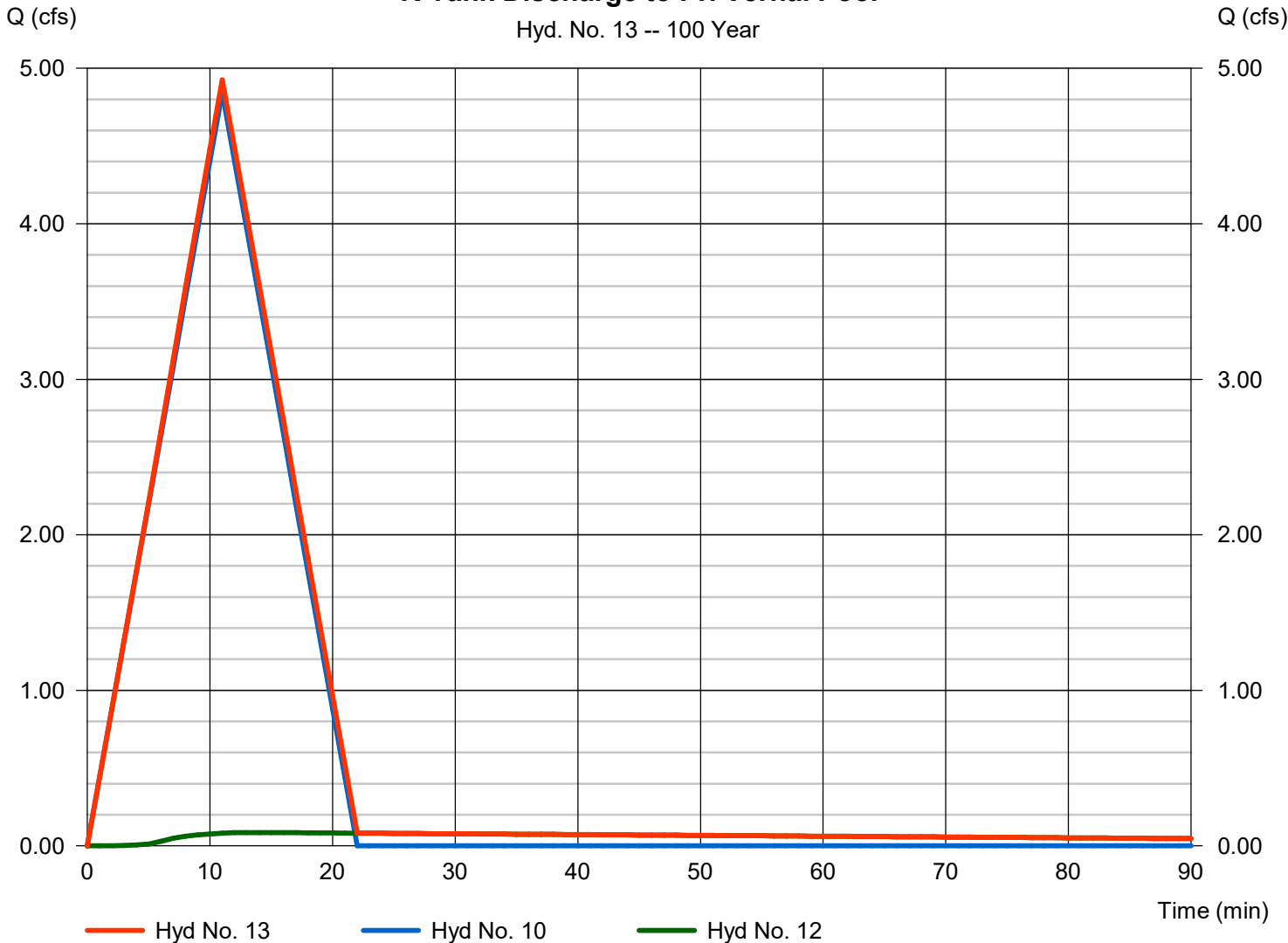
R-Tank Discharge to Pr. Vernal Pool

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 10, 12

Peak discharge = 4.926 cfs  
Time to peak = 11 min  
Hyd. volume = 3,804 cuft  
Contrib. drain. area = 3.750 ac

### R-Tank Discharge to Pr. Vernal Pool

Hyd. No. 13 -- 100 Year



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

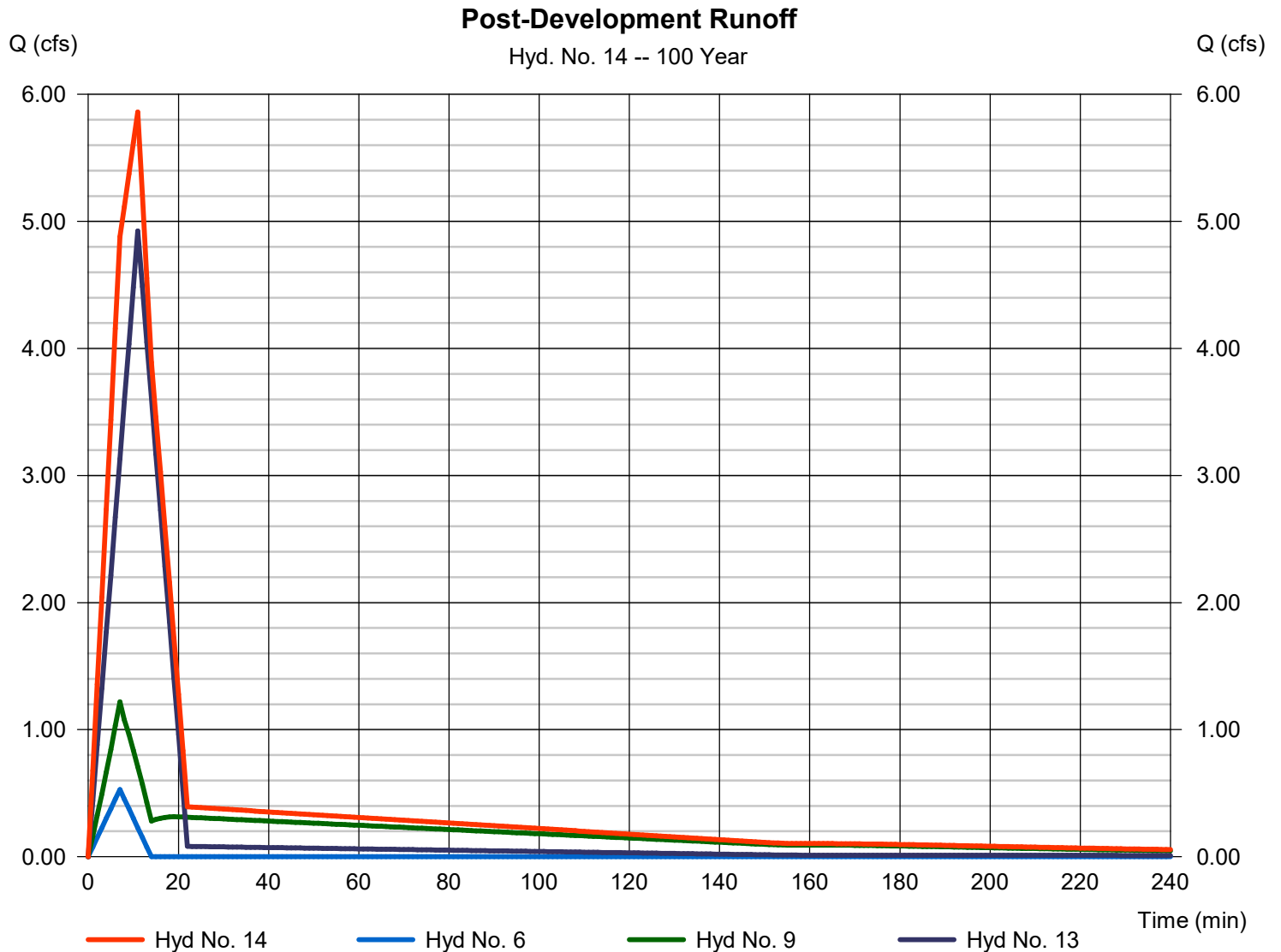
Monday, 11 / 20 / 2023

## Hyd. No. 14

### Post-Development Runoff

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 6, 9, 13

Peak discharge = 5.860 cfs  
Time to peak = 11 min  
Hyd. volume = 7,044 cuft  
Contrib. drain. area = 0.490 ac



## D. Pond Report





## E. Rain Garden Calculations

| Building | Roof Area (ft <sup>2</sup> ) | Volume of 1 inch of Runoff (ft <sup>3</sup> ) |
|----------|------------------------------|---|
| 1        | 1088                         | 91  |
| 2        | 1144                         | 95  |
| 3        | 1088                         | 91  |
| 4        | 1484                         | 124   |
| 5        | 1756                         | 146   |
| 6        | 1556                         | 130   |
| 7        | 2295                         | 191   |
| 8        | 1556                         | 130   |
| 9        | 1756                         | 146   |

**Rain Garden near Building 9**

|              | Contour | Area      |     |                                       |
|--------------|---------|-----------|-----|---------------------------------------|
|              | 677.75  |           | 352 |                                       |
|              | 678.5   |           | 631 |                                       |
| Difference = | 0.75    | Average = | 491 | Volume Provided = 369 ft <sup>3</sup> |
|              |         |           |     | Volume Required = 146 ft <sup>3</sup> |

**Rain Garden near Building 2**

|              | Contour | Area      |     |                                       |
|--------------|---------|-----------|-----|---------------------------------------|
|              | 677.5   |           | 190 |                                       |
|              | 678     |           | 392 |                                       |
| Difference = | 0.5     | Average = | 291 | Volume Provided = 146 ft <sup>3</sup> |
|              |         |           |     | Volume Required = 95 ft <sup>3</sup>  |

**Rain Garden near Building 3 and 4**

|              | Contour | Area      |     |                                       |
|--------------|---------|-----------|-----|---------------------------------------|
|              | 675     |           | 524 |                                       |
|              | 675.5   |           | 746 |                                       |
| Difference = | 0.5     | Average = | 635 | Volume Provided = 318 ft <sup>3</sup> |
|              |         |           |     | Volume Required = 215 ft <sup>3</sup> |

**Rain Garden near Building 5**

|              | Contour | Area      |     |                                       |
|--------------|---------|-----------|-----|---------------------------------------|
|              | 675.25  |           | 136 |                                       |
|              | 676     |           | 315 |                                       |
| Difference = | 0.75    | Average = | 226 | Volume Provided = 169 ft <sup>3</sup> |
|              |         |           |     | Volume Required = 146 ft <sup>3</sup> |

**Rain Garden near Building 6 and 7**

|              | Contour | Area      |     |                                       |
|--------------|---------|-----------|-----|---------------------------------------|
|              | 674.25  |           | 311 |                                       |
|              | 675     |           | 607 |                                       |
| Difference = | 0.75    | Average = | 459 | Volume Provided = 344 ft <sup>3</sup> |
|              |         |           |     | Volume Required = 321 ft <sup>3</sup> |